

TRANSACTIONS

OF THE

LINNEAN SOCIETY.

~~429.e.6~~

TRANSACTIONS

OF THE

NEW ENGLAND SOCIETY

TRANSACTIONS

OF THE

LINNEAN SOCIETY.

VOLUME IV.

L O N D O N :

PRINTED BY J. DAVIS.

SOLD AT THE SOCIETY'S HOUSE, No. 10, PANTON-SQUARE, COVENTRY-STREET;

AND

BY JOHN WHITE, FLEET-STREET.

M.DCC.XCVIII.

5

TRANSACTIONS

OF THE

ROYAL SOCIETY

For Banks

VOLUME

OF THE

ROYAL SOCIETY

OF THE

C O N T E N T S.

- I. *AVES Suffexienses; or, A Catalogue of Birds found in the County of Suffex, with Remarks, by William Markwick, Esq.*
F. L. S. — — — Page I
- II. *Anecdotes of the late Dr. Patrick Browne, Author of the Natural History of Jamaica. By Aylmer Bourke Lambert, Esq.*
V. P. L. S. — — — P. 31
- III. *Descriptions of Three rare Species of British Birds. By G. Montagu, Esq. F. L. S.* — — — P. 35
- IV. *Account of some Species of Fossil Anomia found in Derbyshire. By Mr. William Martin, F. L. S.* — — — P. 44
- V. *Essay on the Eye-like Spot in the Wings of the Locustæ of Fabricius, as indicating the Male Sex. By Professor Anthony Augustus Henry Lichtenstein, F. M. L. S.* — — — P. 51
- VI. *A New Arrangement of the Genus Polytrichum, with some Emendations. By Mr. Archibald Menzies, F. L. S.* — — — P. 63
- VII. Ob-

- VII. *Observations on the Spinning Limax.* By John Latham,
M. D. F. R. S. and L. S. Romfey — — Page 85
- VIII. *An Essay on the Tracheæ or Windpipes of various Kinds of
Birds.* By John Latham, M. D. F. R. S. and L. S. Romfey. 90
- IX. *Observations on Bituminous Substances, with a Description of the
Varieties of the Elastic Bitumen.* By Charles Hatchett, Esq.
F. R. S. Lond. and Edin. F. L. S. &c. — — p. 129
- X. *An Account of the Jumping Mouse of Canada. Dipus Cana-
densis.* By Major-General Thomas Davies, F. R. S. and L. S. 155
- XI. *Observations on the Flowering of certain Plants.* By the Rev.
Thomas Martyn, B. D. F. R. S. V. P. L. S. Regius Professor of
Botany in the University of Cambridge — — p. 158
- XII. *Remarks on some Foreign Species of Orobanche.* By James
Edward Smith, M. D. F. R. S. P. L. S. — p. 164
- XIII. *A Description of Five British Species of Orobanche.* By the
Rev. Charles Sutton, B. D. A. L. S. late Fellow of St. John's
College, Cambridge — — p. 173
- XIV. *Account, accompanied by a Figure, of a minute Ichneumon.* By
George Shaw, M. D. F. R. S. V. P. L. S. — p. 189
- XV. *Description of the Phasma dilatatum.* By Mr. John Park-
inson, F. L. S. — — p. 190
- XVI. *Description of the Blight of Wheat, Uredo Frumenti.* By
A. B. Lambert, Esq. F. R. S. V. P. L. S. — p. 193
- XVII. *Am-*

C O N T E N T S.

vii

- XVII. *Ammophila, a New Genus of Insects in the Class Hymenoptera, including the Spheg sabulosa of Linnæus.* By the Rev. William Kirby, F. L. S. — — Page 195
- XVIII. *The Characters of Twenty New Genera of Plants.* By James Edward Smith, M. D. F. R. S. P. L. S. — p. 213
- XIX. *Further Observations on the Wheat Insect, in a Letter to the Rev. Samuel Goodenough, LL.D. F. R. S. Tr. L. S.* By Thomas Marsham, Esq. Sec. L. S. — — p. 224
- XX. *History of Tipula Tritici, and Ichneumon Tipulæ, with some Observations upon other Insects that attend the Wheat, in a Letter to Thomas Marsham, Esq. Sec. L. S.* By the Rev. William Kirby, F. L. S. — — — p. 230
- XXI. *Account of a New Species of Muscicapa, from New South Wales.* By Major-General Thomas Davies, F. R. S. and L. S. — — p. 240
- XXII. *Observations on the Genus Pausus, and Description of a New Species.* By Adam Afzelius, M. D. Demonstrator of Botany in the University of Upsala, F. R. S. and F. M. L. S. — p. 243
- XXIII. *Observations on the British Species of Bromus, with Introductory Remarks on the Composition of a Flora Britannica.* By James Edward Smith, M. D. F. R. S. P. L. S. — p. 276
- XXIV. *Some Corrections of the general Description of Polytrichum rubellum, p. 79, with an Account of another New Species of the same Genus.* By Mr. Archibald Menzies, F. L. S. — p. 303

CONTENTS

XVII. <i>Chimaphila</i> , a New Genus of Insects in the Class Hymenoptera, including the species <i>Chimaphila</i> of Linnaeus. By the Rev. William Kirby, F.L.S.	—	—	—
XVIII. The Genus of Trees, <i>New Genus</i> of Plants. By Edward Smith, M.D. F.R.S. F.L.S.	—	—	—

ERRATA.

- Page 10, line 3, for "*aretica*" read "*arctica*."
- Page 22, line 11, add "See TAB. I."
- Page 34, line 1, for "Pultney's" read "Pulteney's."
- line 16, for "Theirheld" read "Threlkeld."
- Page 64, line 7 from the bottom, for "*peristomia*" read "*peristomia*."
- Page 96, line 16, for "*Barraka*" read "*Parraka*."

2
3
4

TRANSACTIONS

OF THE

LINNEAN SOCIETY.

I. *Aves Suffexienses; or, A Catalogue of Birds found in the County of Suffex,
with Remarks, by William Markwick, Esq. F. L. S.*

Read May 5, 1795.

DIVISION I. LAND BIRDS.

ORDER I. *Rapacious.*

GENUS I. Falcon.

1 *** **GOLDEN EAGLE.** *Falco Chrysaetos.*

Several years ago I saw a bird of this species, which was
killed at Bexhill in this neighbourhood.

2 Common Buzzard. *Falco Buteo.*

3 Moor Buzzard. *Falco æruginosus.*

4 Kite. *Falco Milvus.*

VOL. IV.

B

5 Peregrine

- 5 Peregrine Falcon. *Falco peregrinus*.
 A bird of this species was lately living in a gentleman's garden at Lewes: it was taken when young in the neighbourhood.
- 6 Henharrier. *Falco cyaneus*. }
 Ringtail. *Falco Pygargus*. }
- 7 Kestrel. *Falco Tinnunculus*.
- 8 Sparrow Hawk. *Falco Nifus*.
- 9 Hobby. *Falco Subbuteo*.
- 10 Merlin. *Falco Æsalon*.
- 11 *** Minute Falcon. *Falco minutus*?
 On the 6th of September 1784 I shot a small hawk which I supposed to be this bird.
- 12 *** Dark brown Hawk, or Buzzard.
 This was alive in the garden at Denn in 1793.

GENUS II. Owl.

* Eared Owls.

- 13 *** Long-eared Owl. *Strix Otus*.
 I never saw this bird myself, but am informed that it has been found here.

** with smooth heads.

- 14 White Owl. *Strix flammea*.
 15 Tawny Owl. *Strix stridula*.
 16 Brown Owl. *Strix Ulula*.

ORDER II. Pies.

GENUS III. Shrike.

- 17 ** Red-backed Shrike. *Lanius Collurio*.

GENUS IV. Crow.

- 18 Raven. *Corvus Corax.*
- 19 Carrion Crow. *Corvus Corone.*
- 20 Rook. *Corvus frugilegus.*
- 21 ** Hooded or Royton Crow. *Corvus Cornix.*
- 22 Jack-daw. *Corvus Monedula.*
- 23 Jay. *Corvus glandarius.*
- 24 Magpie. *Corvus Pica.*
- 25 Red-legged Crow. *Corvus Graculus.*

GENUS V. Roller.

- 26*** Garrulous Roller. *Coracias Garrula.*

A bird of this species was killed in this neighbourhood.

GENUS VI. Cuckoo.

- 27 * Common Cuckoo. *Cuculus canorus.*

GENUS VII. Wryneck.

- 28 * Wryneck. *Jynx Torquilla.*

GENUS VIII. Woodpecker.

- 29 Green Woodpecker. *Picus viridis.*
- 30 Greater spotted Woodpecker. *Picus major.*
- 31 Lesser spotted Woodpecker. *Picus minor.*

I believe this species is rare. Many years ago I shot one;
but have not seen it since.

GENUS IX. Kingsfisher.

- 32 Common Kingsfisher. *Alcedo Ispida.*

GENUS X. Nuthatch.

- 33 European Nuthatch. *Sitta europæa.*

GENUS XI. Hoopoe.

- 34*** Common Hoopoe. *Upupa Epops.*

GENUS XII. Creeper.

- 35 Common Creeper. *Certhia familiaris*.

ORDER III. Passerine.

GENUS XIII. Stare.

- 36 Common Stare. *Sturnus vulgaris*.

GENUS XIV. Thrush.

- 37 Mistle Thrush. *Turdus viscivorus*.
 38 Throftle. *Turdus musicus*.
 39 ** Redwing. *Turdus iliacus*.
 40 ** Fieldfare. *Turdus pilaris*.
 41 Blackbird. *Turdus Merula*.
 42 *** Ring Ouzel. *Turdus torquatus*.
 43 *** Rose-coloured Thrush. *Turdus roseus*.

This bird was killed at East Bourn, and sent to Sir Ashton Lever's Museum, as I was informed.

GENUS XV. Chatterer.

- 44 *** Waxen Chatterer. *Ampelis Garrulus*.

GENUS XVI. Grosbeak.

- 45 *** Common Crossbill. *Loxia Curvirostra*.
 46 *** Hawfinch. *Loxia Coccothraustes*.
 47 Bullfinch. *Loxia Pyrrhula*.
 48 Greenfinch. *Loxia Chlois*.

GENUS XVII. Bunting.

- 49 *** Snow Bunting. *Emberiza nivalis*.

I have seen one specimen of this bird, killed here in a hard winter.

- 50 Yellowhammer. *Emberiza Citrinella*.
 51 Common Bunting. *Emberiza Miliaria*.
 52 Reed Sparrow. *Emberiza Schœniclus*.

GENUS XVIII. Finch.

- 53 House Sparrow. *Fringilla domestica*.
54 Chaffinch. *Fringilla cælebs*.
55 *** Brambling. *Fringilla Montifringilla*.
56 Goldfinch. *Fringilla Carduelis*.
57 *** Siskin. *Fringilla Spinus*.
58 Linnet. *Fringilla Linota*.

GENUS XIX. Flycatcher.

- 59 * Spotted Flycatcher. *Muscicapa Grisola*.
60 Goldfinch. *Muscicapa atricapilla*.

I think I once saw this bird sitting on the walls of the old castle at Winchelsea.

GENUS XX. Lark.

- 61 Sky Lark. *Alauda arvensis*.
62 Wood Lark. *Alauda arborea*.
63 Tit Lark. *Alauda pratensis*.

Seen here in summer only.

- 64 ** Lesser Tit Lark. *Alauda trivialis*.

Seen here in winter only, and then in flocks together.

GENUS XXI. Wagtail.

- 65 White Wagtail. *Motacilla alba*.
66 Grey Wagtail. *Motacilla Boarula*.
67 Yellow Wagtail. *Motacilla flava*.

GENUS XXII. Warbler.

- 68 * Nightingale. *Sylvia Luscinia*.
69 * Pettychaps. *Sylvia hortensis*.
70 * Black-cap. *Sylvia atricapilla*.
71 Hedge-sparrow. *Sylvia modularis*.
72 * Redstart. *Sylvia Phænicurus*.
73 * White-throat. *Sylvia cinerea*.

- 74 Sedge Warbler. *Sylvia salicaria.*
 75 Red-breast. *Sylvia Rubecula.*
 76 Stone-chat. *Sylvia Rubicola.*
 77 * Whin-chat. *Sylvia Rubetra.*
 78 * Wheat-ear. *Sylvia Oenanthe.*
 79 Wren. *Sylvia Troglodytes.*
 80 Gold-crested Wren. *Sylvia Regulus.*
 81 * Willow Wren. *Sylvia Trochilus.*

GENUS XXIII. Titmouse.

- 82 Great Titmouse. *Parus major.*
 83 Blue Titmouse. *Parus cæruleus.*
 84 Colemouse. *Parus ater.*
 85 Marsh Titmouse. *Parus palustris.*
 86 Long-tailed Titmouse. *Parus caudatus.*

GENUS XXIV. Swallow.

- 87 * House Swallow. *Hirundo rustica.*
 88 * Martin. *Hirundo urbica.*
 89 * Sand Martin. *Hirundo riparia.*
 90 * Swift. *Hirundo Apus.*

GENUS XXV. Goatfucker.

- 91 * European Goatfucker. *Caprimulgus europæus.*

ORDER IV. Columbine.

GENUS XXVI. Pigeon.

- 92 Common Pigeon. *Columba Oenas.*

Seen here only in the domestic state; but I have been informed, that they are found in the wild state in the western part of this county.

- 93 Ring Dove. *Columba Palumbus.*

94 * Com-

found in the County of Sussex.

7

- 94 * Common Turtle. *Columba Turtur*.

Seen here only in the summer, generally two together;
but not very common.

ORDER V. *Gallinaceous*.

GENUS XXVII. Peacock.

- 95 Peacock. *Pavo cristatus*.

Only in a domestic state.

GENUS XXVIII. Turkey.

- 96 Common Turkey. *Meleagris Gallopavo*.

Only in a domestic state.

GENUS XXIX. Pintado.

- 97 Pintado, or Guinea Hen. *Numida Meleagris*.

Only in a domestic state.

GENUS XXX. Pheasant.

- 98 Common Barn-door Fowl. *Phasianus Gallus*.

Only in a domestic state.

- 99 Common Pheasant. *Phasianus colchicus*.

GENUS XXXI. Grouse.

- 100 Black Grouse. *Tetrao Tetrix*.

I have seen this species on St. Leonard's forest near
Horsham.

GENUS XXXII. Partridge.

- 101 Common Partridge. *Perdix cinerea*.

- 102 * Common Quail. *Perdix Coturnix*.

GENUS XXXIII. Bustard.

- 103 Common Bustard. *Otis Tarda*.

Sometimes seen on our South Downs.

- 104 * Thick-knee'd Bustard. *Otis oedipnemus*.

DIVISION

DIVISION II. WATER BIRDS.

ORDER VI. *With cloven Feet.*

GENUS XXXIV. Heron.

- 105 Common Heron. *Ardea cinerea.*
 106 Bittern. *Ardea stellaris.*

GENUS XXXV. Curlew.

- 107 Common Curlew. *Numenius Arquata.*
 108 Whimbrel. *Numenius Phæopus.*

GENUS XXXVI. Snipe.

- 109 ** Woodcock. *Scolopax Rusticola.*
 110 *** Great Snipe. *Scolopax major.*

I have seen one of this species which was killed near
 Horsham.

- 111 ** Common Snipe. *Scolopax Gallinago.*
 112 ** Jack Snipe. *Scolopax Gallinula.*
 113 *** Red Godwit. *Scolopax lapponica.*
 114 Redshank. *Scolopax Calidris.*
 115 Common Godwit. *Scolopax leucophæa.*

GENUS XXXVII. Sandpiper.

- 116 Lapwing. *Tringa Vanellus.*
 117 *** Grey Plover. *Tringa Squatarola.*
 118 Green Sandpiper. *Tringa Ochropus.* }
 Wood Sandpiper. *Tringa Glareola.* }
 119 Common Sandpiper. *Tringa Hypoleucos.*
 120 Sea Sandpiper. *Tringa maritima.*
 121 ** Purre. *Tringa Cinctus.*
 122 Dunlin. *Tringa alpina.*
 123 ** Small grey Sandpiper. *Tringa arenaria.*

GENUS

GENUS XXXVIII. Plover.

- 124 Golden Plover. *Charadrius pluvialis*.
125 * Sea Lark. *Charadrius Hiaticula*.
126 ** Sanderling. *Charadrius Calidris*.

GENUS XXXIX. Oyster-catcher.

- 127 Common Oyster-catcher. *Hæmatopus ostralegus*.

GENUS XL. Rail.

- 128 Water Rail. *Rallus aquaticus*.

GENUS XLI. Gallinule.

- 129 * Land Rail. *Gallinula Crex*.
130 Common Water-hen. *Gallinula chloropus*.
131 *** Spotted Gallinule. *Gallinula Porzana*.

This bird was once shot by the side of a mill-pond in this neighbourhood.

ORDER VII. *With pinnated Feet.*

GENUS XLII. Coot.

- 132 Common Coot. *Fulica atra*.

GENUS XLIII. Grebe.

- 133 *** Tippet Grebe. *Podiceps cristatus*.
134 *** Eared or lesser crested Grebe. *Podiceps auritus*.

ORDER VIII. *Web-footed,*

* with long legs.

GENUS XLIV. Avosetta.

- 135 Avosetta. *Recurvirostra avosetta*.

** with short legs.

GENUS XLV. Auk.

- 136 Puffin. *Alca arctica.*
 137 Razor-bill. *Alca Torda.*
 138 Black-billed Auk. *Alca Pica.*

GENUS XLVI. Diver.

- 139 Guillemot. *Colymbus Troille.*
 140 Speckled Diver. *Colymbus stellatus.*

GENUS XLVII. Tern.

- 141 * Greater Tern. *Sterna Hirundo.*
 142 * Lesser Tern. *Sterna minuta.*
 143 * Black Tern. *Sterna fiffipes.*

GENUS XLVIII. Gull.

- 144 Black and white Gull. *Larus marinus.*
 145 Wagel. *Larus nævius.*
 146 Common Gull. *Larus canus.*
 147 Black-headed Gull. *Larus ridibundus.*
 148 ** Winter Mew. *Larus hybernus.*
 149 Skua. *Larus cataraetes.*

I am much mistaken if I have not seen this gull on our coast.

- 150 Parrock Gull. *Larus tridaetylus.*

I had one of these in my possession: it was caught alive in a hard frost near my house, and I have since seen it on the sea-shore.

GENUS XLIX. Merganser.

- 151 *** Dun Diver. *Mergus Castor.*
 152 *** Red-breasted Goosander. *Mergus Serrator.*
 153 *** Minute Merganser. *Mergus minutus.*

154 Smew. *Mergus Albellus*.

I never met with this bird, but have heard it called the Magpie Diver; so that I suppose it is sometimes seen on this coast.

GENUS L. Duck.

155 *** Wild Swan. *Anas Cygnus*.

Sometimes killed on our coast in hard winters.

156 Tame Swan. *Anas Olor*.

157 Canada Goose. *Anas canadensis*.

Seen in the river at Horsham in a domestic state.

158 Wild Goose. *Anas Anser ferus*. }
Tame Goose. *Anas Anser domestica*. }

159 *** Laughing Goose. *Anas albifrons*.

Sometimes killed on our coast in hard winters.

160 *** Bean Goose. *Anas Segetum*.

161 *** Bernacle. *Anas erythropus*.

One of this species was killed on our coast in the hard winter 1789.

162 Brent Goose. *Anas Bernicla*.

Seen in a domestic state.

163 Muscovy Duck. *Anas moschata*.

Seen in a domestic state.

164 Chinese Goose. *Anas cygnoides*.

Seen in a domestic state.

165 Scoter or Black Duck. *Anas nigra*.

Sometimes seen in great flocks at sea, not far from shore.

166 Common Wild Duck. *Anas Boschas*. }
Tame Duck. *Anas Boschas domestica*. }

167 ** Scaup Duck. *Anas Marila*.

Killed on our coast in 1789.

- 168 Shieldrake. *Anas Tadorna.*
 169 ** Wigeon. *Anas Penelope.*
 170 ** Pochard. *Anas ferina.*
 171 ** Pintail Duck. *Anas acuta.*
 172 ** Golden Eye. *Anas Clangula.*
 173 Teal. *Anas Crecca.*

GENUS LI. Pelican.

- 174 Corvorant. *Pelecanus Carbo.*
 175 *** Gannet. *Pelecanus bassanus.*

Once shot in this neighbourhood.

N. B. One asterisk (*) immediately after the number affixed to the bird, signifies a summer bird of passage; two asterisks (**) a winter bird of passage; and three (***) an occasional visitor, or bird whose migration is irregular and uncertain. The rest, without any asterisk, are supposed to be resident here in this island, throughout the whole year.

NOTES, or REMARKS, on the foregoing CATALOGUE.

- No. 6.—Henharrier. *Falco cyaneus.* }
 Ringtail. *Falco Pygargus.* }

SEVERAL years ago I shot two of the blue grey Hawk, or Henharrier, which differed considerably in the colour of their plumage. The first was of a light ash-colour, marked with reddish oblong spots on the breast and hinder part of the head, like the figure in the folio edition of the British Zoology; the other had none of these

these oblong reddish spots, either on the breast or hinder part of the head, but was all over of the same pale ash-colour, becoming gradually lighter on the under side to the belly, which was white. This induced me to conclude (perhaps too hastily) that these two birds were male and female of the same species, and that the brown hawk, with a white rump or ring-tail, was a different species; but a gentleman in this neighbourhood lately informed me, that his game-keeper, some time last summer, killed both the Hen-harrier and the Ringtail from the same nest, and that there is no doubt of their being male and female of the same species. If so, the difference in the colour of my two birds must arise from their different ages; the first, with reddish spots, being, as I suppose, the youngest, and still retaining somewhat of the ferruginous colour of the Ringtail; the other, which was all over of a light ash-colour, I suppose to have been an old bird, and had attained to its full colour.

No. 12.—Dark brown Hawk or Buzzard.

In the winter 1792, two of these birds were observed to frequent the high trees in Denn Park, in pursuit of the rooks. One of them was taken, and kept alive in the garden, where I found it, and made a drawing and description of it. If it is not a variety of the Moor Buzzard, *Falco aruginosus*, it probably is a new British species; for I cannot find, either in Mr. Pennant's or Mr. Latham's works, any description that perfectly agrees with it. It seems to me to be of less dimensions, of a more slender make, and more active than the Moor Buzzard: but, as I never had this latter bird in my possession, I cannot form a proper judgment upon it.

No. 21.—Hooded or Royston Crow. *Corvus Cornix*.

This bird is, with respect to us, a bird of passage, being seen only in the winter, and then only near the sea-side. On the 30th
of

of March 1790, as I was walking in my land, which is about four miles distant from the sea-shore, I saw, what I thought had the appearance of migration in these birds, a small flock of them (less than twenty in number), having passed steadily by me from the sea towards the north.

No. 25.—Red-legged Crow. *Corvus Graculus*.

This bird frequents the South Downs about Beachy Head and East Bourn, where it is called the Red-billed Jack-daw.

No. 26.—The Roller. *Coracias Garrula*.

This uncommon bird was killed in our neighbourhood: I made a drawing from its skin, which differed, in some respects, from Mr. Edward's figure; whence I had reason to think that mine was a young bird of the preceding year, driven across the sea into this island by the stormy weather which prevailed about that time.

No. 27.—The Cuckoo. *Cuculus canorus*.

The old birds of this species leave us when they cease to sing, which is about the latter end of June; but the young ones are sometimes seen very late in the autumn,—as late as the 28th of September.

No. 34.—The Hoopoe. *Upupa Epops*.

I once had this beautiful bird alive in my possession; and, at another time, one of these birds flew before my horse, near East Bourn in this county, and suffered me to approach near enough to distinguish its colour, and even its crest, though it carried the latter folded up as it flew. From what I could observe in both these birds, it seems to resemble the Jay in its habits, particularly in its note or screech, and in its manner of flying.

No. 44.

No. 44.—The Chatterer. *Ampelis Garrulus.*

This rare bird sometimes makes its appearance here in hard winters: I have met with two instances of it.

No. 45.—The Cross-bill. *Loxia Curvirostra.*

I have known two or three instances of this bird being killed in the neighbourhood. A male bird of this species was sent me by a friend on the 15th of January 1795.

No. 46.—The Hawfinch. *Loxia Coccothraustes.*

Two instances of this bird's being met with here, in hard winters, have fallen within my observation.

No. 54.—The Chaffinch. *Fringilla cælebs.*

Mr. White, in his Natural History of Selborne, asserts, that only the hen Chaffinches are to be seen in winter at that place; or, at most, but very few cocks among them. Such a circumstance (which confirms Linnæus's account of the migration of the female Chaffinches only) happening so near to this place as the very next county, has induced me to take particular notice of these birds, especially in the winter. Not long since, as I was riding, I observed a number of Chaffinches in the hedges on each side of the road, and, as far as I could distinguish, most of them appeared to be cocks. I now began to think that I had discovered some traces of this partial migration, and that the hens were gone, and had left their mates behind them: but my subsequent observations have not tended to confirm this idea; for, since that time, I have seen at least as many hens as cocks; particularly on the 22d of this month, January 1795, nineteen of these birds were killed and brought to me. On examination, there proved to be ten females and nine males; so that I must revert back to my original opinion, that no such partial migration of one sex only takes place here.

No. 55.

No. 55.—The Brambling. *Fringilla Montifringilla.*

This bird is sometimes driven hither (as I suppose) by the severity of the winter in more northern countries. I have met with a few instances of it in very hard winters.

No. 57.—The Siskin. *Fringilla Spinus.*

The visits of this bird to us in this neighbourhood seem to be very irregular and uncertain. Some years ago, I saw it several times, in the month of April only, frequenting some fir-trees near my house, as may be seen in my Table published in the First Volume of the Linnean Transactions; but for these last fourteen years I have never seen it once.

No. 59.—The spotted Flycatcher. *Muscicapa Griseola.*

The chief food of this bird being flies, it does not make its appearance here till late in the spring,—never before May. A pair of these birds have constantly built their nest, every year, in the same hole of the wall of my house, for a great number of years; which leaves but little room to doubt, that the same individual birds return every year to the same place to build their nest. From whence do they come? Do they come from a far distant country (lying perhaps on the other side the equator), and repair annually to the same identical spot for the purpose of incubation? or, Do they, at the proper season of the year, come out from their hiding-place near at hand, where they have passed the winter in a torpid state, secure from the severity of that season?

No. 69.—The greater Pettychaps. *Sylvia hortensis.*

I have had two birds in my possession, which, from their size, I am persuaded were of this species: there was some difference in their colour, one being of a more olivaceous green than the other; and

and also in their size, but both of them, were larger than the common Pettychaps, *Sylvia Hippolais*.

No. 74.—The Sedge Warbler. *Sylvia salicaria*.

This bird is seen here only in the summer, and is then not very common; it is a very lively active bird, which frequents the reeds near ponds, and sings very prettily.

No. 78.—The Wheat-ear. *Sylvia Oenanthe*.

This little bird, which is found in great plenty on our South Downs, is justly esteemed a great delicacy for the table, and vast numbers of them are annually caught in traps by the shepherds as they tend their flocks. These Wheat-ear traps consist of horse-hair nooses, placed under a sod of turf dug out of the ground for that purpose. They are first set up every year on St. James's day, the 25th of July, soon after which time they are caught in numbers truly astonishing, when we reflect that it is a solitary bird, more than two or three being scarcely ever seen together. Observing that all the birds which were caught in the proper season had the same coloured plumage as the hen bird, I made some enquiries respecting them of a shepherd at East Bourn, who informed me, that the flights consisted chiefly of young birds, which arrived in the greatest numbers when a westerly wind prevailed, and that they always came against the wind. He told me that on the 15th and 16th of August 1792 he caught twenty-seven dozen with only a few old birds amongst them; but this is a small number when compared with the almost incredible quantity sometimes taken. A Gentleman informed me, that his father's shepherd once caught eighty-four dozen in one day. Early in the spring only a few old birds are to be seen, and none (that I could ever observe) in the winter. I enquired of the shepherd whether these birds breed on the South Downs: the answer was, A few only.

No. 80.—The Gold-crested Wren. *Sylvia Regulus*.

This, I believe, is the smallest bird in Europe; yet, notwithstanding its diminutive size, it is able to brave our severest winters, as I have before observed. Being very small, fond of solitude, and living chiefly in the woods, it is not often observed; but I am inclined to think that these birds abound in greater numbers than is generally supposed, because, on the 4th of January 1792, I counted eight or nine of them playing about in a short cut copse within my sight at the same time. In summer it sings very prettily; its note is weak, as may be supposed from its size, but melodious. Where and how it breeds, I know not, having never seen its nest.

No. 81.—The common Willow Wren. *Sylvia Trochilus*.

I have not yet been able to ascertain the three different varieties of this bird mentioned by Mr. White in his Natural History of Selborne. I have more than once shot it in the very act of uttering its sibilous shivering note, spoken of by that Gentleman; but when I got it into my possession, instead of being his largest Willow Wren, it proved to be the common kind, or *Motacilla Trochilus* of Linnæus. It is an elegant, lively, active little bird, which is very common here in the summer; and I once found its nest at the bottom of a furze bush.

No. 86.—The long-tailed Titmouse. *Parus caudatus*.

These birds are seen in small flocks or companies together in the winter time, flying from bough to bough in the woods and hedges.

No. 89.—The Sand Martin. *Hirundo riparia*.

Not far from my house is a sand-pit, where these birds have made many holes, and build their nests every year. By frequently
visiting

visiting this pit in the spring, I have pretty accurately ascertained the time of their arrival, or first appearance, to be early in the month of May. In the year 1789 none were to be seen on the 28th of April, but on the 6th of May several were flying about the holes. In 1790, on the 8th of May none were to be seen, but on the 12th of the same month several made their appearance. In 1791 I visited the pit on the 5th and 7th of May, but could discover no birds; yet on the 10th, when I visited it again, several were flying about. Since that time my further observations have been prevented by some House Sparrows having taken possession of the holes, and driven away the Sand Martins.

No. 90.—The Swift. *Hirundo Apus.*

During my residence at East Bourn in the year 1792 I had an opportunity of marking the time of the departure or disappearance of these birds with some accuracy. I lodged near the church, round which building I used constantly to see them playing on the wing till the 10th of August, after which day not one was to be seen.

No. 102.—The Quail. *Perdix Coturnix.*

These birds undoubtedly breed on our South Downs, and in the autumn are found by the sportsmen in the stubbles in bevvies or broods several together. It is probable that most of them migrate; but that they do not all leave this country I can aver, for I well remember, that, in company with a friend, we found three or four brace of quails in one morning in the middle of winter (about Christmas) in a field of turneps at East Bourn.

No. 104.—The thick-kneed Bustard. *Otis oedipnemus.*

It is called here the Stone Curlew, and breeds on the South Downs, where its whistling note is frequently heard in a summer's evening.

evening. That most of these birds leave us in the autumn is most probable; but I have known one instance of its having been killed here in the winter.

No. 105.—The common Heron. *Ardea cinerea*.

Hérons frequent our marshes and sides of ponds in search of their food. They probably come hither from Penshurst Park in Kent, where there is a large Heronry; and vast numbers of their nests are to be seen in some very large tall beech-trees,—often many nests in one tree.

No. 106.—The Bittern. *Ardea stellaris*.

This bird is sometimes met with here, and in the spring is frequently heard to blow or make a loud hollow sound. This sound has been supposed from the bird's putting its bill into the hollow of a reed: this I suspect to be a vulgar error, and rather think that it is the call of love uttered, in the spring, by the male, to invite the female to him. I once shot one of these birds in frosty weather: it fell on the ice, which was only strong enough to support my dogs, and they immediately rushed forwards to attack, but, being only wounded, it defended itself so vigorously with its sharp-pointed bill, that not a dog would touch it, till I fired again and killed it.

No. 107.—The common Curlew. *Numenius Arquata*.

This bird is to be met with on our sea-coast, both in summer and winter.

No. 108.—The Whimbrel. *Numenius Phaeopus*.

This bird is not so common as the foregoing species; I have met with only one instance of its being found here.

No. 110.

No. 110.—The Great Snipe. *Scolopax major*.

On the 1st of October 1793 I received this bird from a friend. I have no doubt of its being the *Scolopax major* of Mr. Latham, although it was inferior in size and weight, and differed somewhat in colour from that Gentleman's description; perhaps mine was a young bird.

No. 113.—The Red Godwit. *Scolopax lapponica*.

These birds are sometimes found on our sea-coast in great numbers. Many years ago, two persons fired amongst a flock of them, and killed ten: these were brought to me, and I made drawings from them; but have not seen one of the species since.

No. 115.—The common Godwit.—*Scolopax leucophæa*.

I believe this bird is not often met with here. The only one I ever saw, was one that I shot on the sea-coast at Bexhill on the 22d of September 1792; and I suspect that to have been a young bird, because it was of a very light colour, and its measurements were far short of Mr. Latham's. It was boring into the mud with its bill in search of food when I shot it.

No. 117.—The Grey Plover. *Tringa Squatarola*.

This bird is seen on our sea-coasts only in the winter, and then but seldom. I have seen only one, which was killed on the 13th of January 1776 by the sea-side at Bexhill.

No. 118.—The Green Sandpiper. *Tringa Ochropus*. }

The Wood Sandpiper. *Tringa Glareola*. }

These birds agree so nearly in size, mode of living, and other respects, that they are with the greatest probability supposed to be only varieties of the same species, perhaps male and female. A

few of these birds frequent the banks of the river at Horsham, and in 1793 I was in hopes that I should be able to ascertain whether it were so or not; but I could procure only one of them, which proved to be the *Tringa Ochropus*. The *Tringa Glareola* is described in the First Volume of the Linnean Transactions.

No. 119.—The common Sandpiper. *Tringa Hypoleucos*.

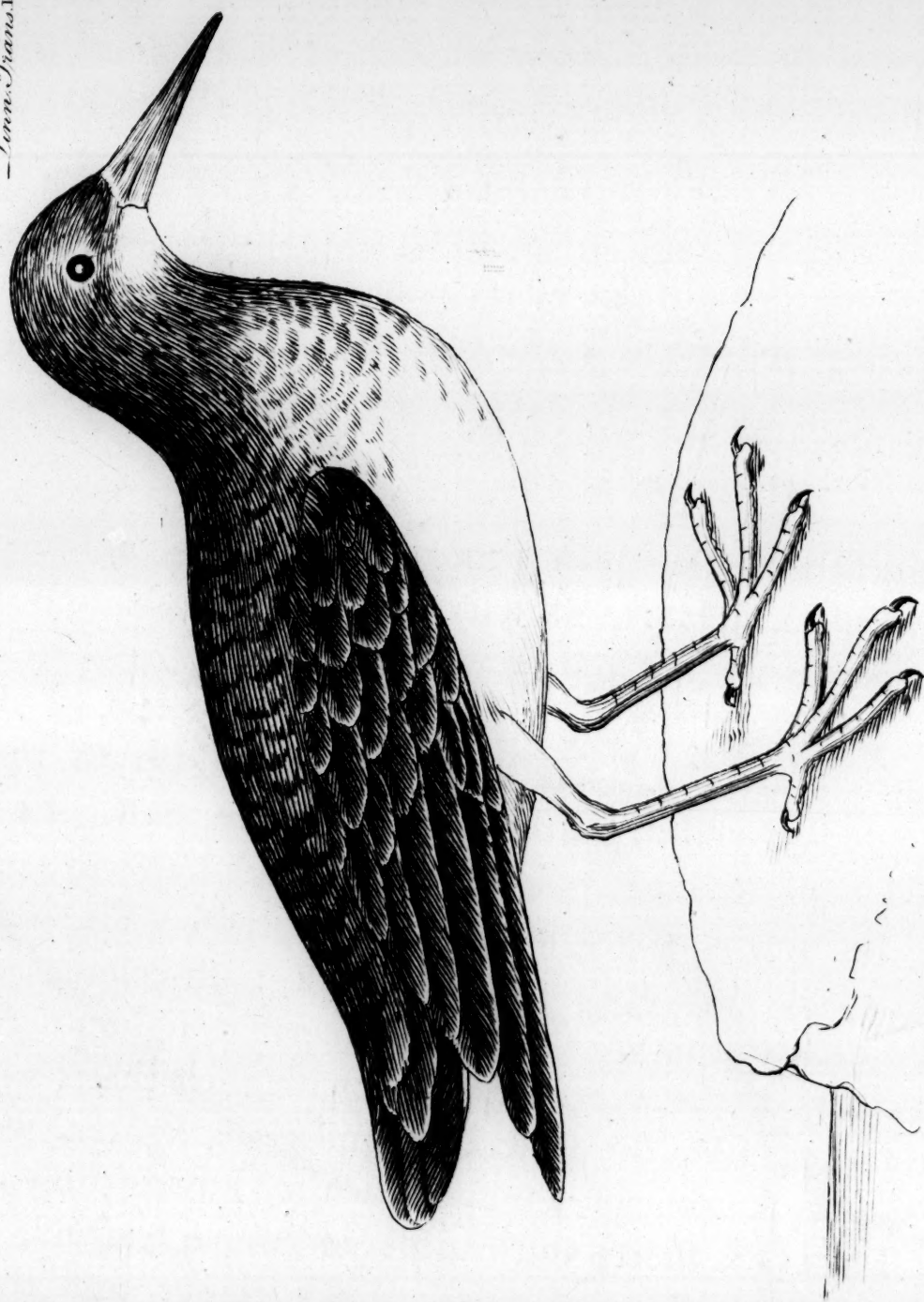
This is a solitary bird, frequenting the sides of ponds and rivulets. I never had but one in my possession, and that I shot by the side of a large mill-pond in the year 1773.

No. 120.—The Sea Sandpiper. *Tringa maritima*. Lath. Orn. 11. p. 731. n. 18.

On the 8th of December 1796 a small flock, consisting of ten or twelve of these birds, were seen on the sea-coast near Bexhill: two of them were shot and brought to me.

Its length from the tip of the bill to the end of the tail is eight inches and an half; its breadth from tip to tip of the wings when extended, fifteen inches and an half. Its bill is an inch and a quarter long, yellow from the base half way, and the tip black. Its weight is two ounces and an half. The head, neck, shoulders and back are of a dark dusky ash-colour, with the edges of each feather on the back somewhat lighter: the prime quill feathers of the wings are dusky, with their shafts white, particularly the first: the secondary quills are lighter, with white tips; and the hindmost are almost white, having only one dusky spot. The tail is short, and consists of twelve feathers, of which the four middlemost are of a dark dusky colour, and the four on each side *gradually* shorter, and of a pale ash-colour edged with white. The under-side of the neck and breast dusky, with the feathers on the breast fringed with white. The chin, lower part of the breast,

Ann. Trans. IV. tab. 1, p. 22.





breast, belly, thighs and vent white, except a few dusky spots on the sides, thighs and vent. The legs and feet are yellow, naked above the knees; and the toes entirely divided, without the least connecting membrane between any of them. The claws are blackish.

No. 121.—The Purre. *Tringa Cinclus.*

These birds are found in great flocks on our sea-coast in the winter. I have had several of them in my possession. There are three remarkable varieties of this species.

On the 1st of February 1776, a bird of the first variety, in its winter dress, from which I made this description and a figure, was shot on the sea-shore near Bexhill.

Its length from the tip of the bill to the end of the tail is seven inches; its breadth from tip to tip of the wings when extended, thirteen inches and an half. Its bill is an inch and a quarter long, black, and rather bent or curved downwards near the tip. The top of the head, hinder part of the neck, and the back, are of a dusky brownish ash-colour, spotted with darker brown: the upper covert feathers of the wings are brown, with the edges of a lighter colour: the quill feathers of the wings of a blackish brown, having their bases and shafts white: the middle feathers of the tail of a dusky brown, and the rest lighter or whitish. The under side of the neck, and upper part of the breast, are of a pale dusky brown, spotted with darker brown: the rest of the breast, belly, and covert feathers under the tail, are of a pure white. The legs and feet are black, and have not any membrane or web between the joints of any of the toes.

I have since seen several of these birds in the winter, which all agreed exactly with the above description, except a small variation in respect to size.

The

The second variety is in a mixed state, between its winter and summer dress. On the 18th of September 1792 I shot one of these birds, amongst ten or a dozen more, on the sea-shore at Bexhill.

Its length from the tip of the bill to the end of the tail was seven inches; the breadth from tip to tip of the wings when extended, fourteen inches; and the bill, which was black and a little bent near the tip, one inch and a quarter long. The head and hinder part of the neck were variegated with reddish brown and black, the middle of the feathers being of a dark brown or black, with the edges of a pale reddish brown. The feathers on the shoulders were of an ash-coloured brown, and those on the back of a dark brown or black in the middle, having their edges of a pale yellowish or reddish brown, not very unlike those of the Jack Snipe. The covert feathers of the wings were dusky, edged with pale brown, and those next the quills tipped with white. The quills were of a dusky black with white shafts and bases. The tail was rather pointed; the two middlemost feathers were of a dark brown edged with light yellowish brown, and the rest were of a light ash-colour with white shafts. The chin, belly and vent were white, but the breast was of a light brown, streaked with darker brown; and the sides of the belly were also marked with dusky spots. The legs were naked above the knees, of a black colour; and the toes were entirely divided, without any web between them.

Some time about the middle of the summer 1795 I had an opportunity of seeing a bird of the third variety in its summer dress, whose whole upper side and breast were variegated with dusky and yellowish brown, the middle of the feathers being of a blackish, and the edges of a yellowish brown. Its chin, lower part of the breast, belly, thighs and vent were white; and its bill, legs and feet black.

All

All these birds agreeing exactly in size, shape, length and colour of the bill and legs, particularly in having the toes entirely divided, without any web between any of the joints; and, lastly, in the shafts of the quill feathers being white in all of them, induces me to look upon them as different varieties of the same species: if so, this bird not only changes its place of residence, but its dress also, according to the different seasons of the year.

No. 122.—The Dunlin. *Tringa alpina*.

On the 31st of May 1780 I saw this bird on the sea-shore at Bexhill: it suffered me to approach near enough to distinguish its colours, especially the black mark on its breast, as figured in the folio edition of the British Zoology.

No. 123.—The small grey Sandpiper. *Tringa arenaria*.

On the 31st of December 1793 a bird was brought to me which, I have no doubt, is the *Tringa arenaria* of Linnæus: its shape was short and thick, very different from that of the Sanderling or Cur-willet; and it had also a perfect back toe with a claw, which that bird is entirely destitute of. I was informed that it was killed on the sea-coast near Rye, and that they were seen there in flocks in the winter.

No. 124.—The Golden Plover. *Charadrius plumialis*.

This species is frequently killed on our sea-coast in the winter; and, if my memory does not fail me, I have also shot it in the summer. But the most singular circumstance relating to this bird is, that it varies in one of its characteristic marks. Two birds of this species, from which I drew a figure and description, had no back toe, as appears both from my figure and description: and indeed, to the best of my recollection, none that I ever saw had any back

toe, except one I shot on the 22d of September 1792, which, to my great surprize, had a small back toe.

No. 125.—The Sea Lark. *Charadrius Hiaticula*.

These birds are very common on our sea-coast in the summer; but I have reason to think that they, or at least the generality of them, leave us in the winter; for, during my residence at Hastings, from the 19th of November 1792 to the 11th of February 1793, I never once saw this bird, although I was constantly on the look-out to take particular notice of this and other sea-birds: but I remember one instance of this bird's being killed during a hard frost in the winter by the sea-side, near Pevensey; and I have more than once observed it so early as February and March, particularly on the 19th of February 1787.

No. 126.—The Sanderling, or Curwillet. *Charadrius Calidris*.

These birds frequent our sea-coast in the winter, and are seen in large flocks. I received two of them in about a fortnight after I had drawn and described the small grey Sandpiper: they were so different from that bird in shape, colour, and particularly in the total want of a back toe, that I have no doubt of their being a distinct species, and even that they belong to a different genus, as Linnæus has placed them.

No. 127.—The Sea-Pie, or Oyfter-catcher. *Hæmatopus ostralegus*.

It is called here the Olive. I have frequently seen them in pairs on our sea-coast in the summer, but do not recollect having ever seen them in the winter.

No. 133 —The Crested or Tippet Grebe. *Podiceps cristatus*.

This bird is sometimes found here in hard winters. In the year 1789 I had a dead bird of this species in my possession: its head appeared

appeared to be quite smooth, without any crest, and I suppose it was either a female or a young bird; for, on the 27th of January in this present year 1795, a bird of this species was discovered sitting under a hedge in the parish of Battle, at the distance of six or seven miles from the sea: it was so much weakened by the severity of the frost, that it suffered itself to be taken, and was brought to me alive. I kept it alive till I had made drawings and a description of it, during which time it erected the feathers on the top of the head into two tufts or crests, and swelled out the white feathers beneath its cheeks into a kind of ruff, so as to make the head appear as if encircled by a sort of hood. It was very pugnacious, striking fiercely with its sharp bill whenever I put my hand near it, and at the same time uttered a harsh scream. According to authors this bird spends its life almost wholly in the water:—is it not singular then that it should be found on dry ground, not near any water, and at so great a distance from the sea, especially as its wings are so short and unfit for long flight?

No. 134.—The Eared or Lesser-crested Grebe. *Podiceps auritus.*

This bird is very rare in our neighbourhood: I have had one in my possession, which was killed in a fresh water pond on the 2d of May 1789.

No. 135.—The Avosetta. *Recurvirostra Avosetta.*

This bird is not uncommon on our sea-coast in summer; but whether it is to be found here in winter I cannot tell, as I do not recollect to have ever seen it at that season. That it breeds here I have been an eye-witness, for I remember that, several years ago, I found in the marshes near Rye, a young one of this species, which appeared to have been just hatched, and I took it up in my hands,

hands, whilst the old birds kept flying round me. I have also seen it in the summer on the sea-coast at Bexhill.

No. 136.—The Puffin. *Alca arctica*.

It is found on this coast, and known about East Bourn by the name of the Parrot-billed Wille.

No. 137.—The Razor-bill. *Alca Torda*.

I think this bird is known here by the name of the common Wille; if so, it breeds in vast numbers in the cliffs at Beachy Head.

No. 138.—The black-billed Auk. *Alca Pica*.

I believe it is sometimes found on our sea-coast. In the hard winter of 1789 a bird of the Auk kind was brought to me, which I took to be this species.

No. 139.—The Guillemot. *Colymbus Troille*.

I have seen one stuffed and preserved, which I understood was taken on this coast.

No. 140.—The speckled Diver. *Colymbus stellatus*.

It is found on this coast: I have seen one or two specimens of it.

No. 141.—The greater Tern. *Sterna Hirundo*.

No. 142.—The lesser Tern. *Sterna minuta*.

No. 143.—The black Tern. *Sterna fiffipes*.

The two first species are very common on our coast in the summer; but the black Tern is, I believe, very rare, for I never saw it but once.

No. 151.

No. 151.—Dun Diver. *Mergus Castor*.

No. 152.—Red-breasted Goosander. *Mergus serrator*.

No. 153.—Minute Merganser. *Mergus minutus*.

I have seen all these birds; they were killed on our sea-coast in the winter.

No. 160.—The Bean Goose. *Anas Segetum*. *Lath. Orn.* 11. p. 843. n. 28.

On the 8th of December 1796 three of these birds were seen near the sea-shore at Bexhill, two of which were shot, and one of them, having only its wing broken, was alive when I received it. When I attempted to touch it, it pecked at my hand, and hissed exactly like the common tame Goose.

The largest of the two measured from the tip of the bill to the end of the tail two feet three inches; and from tip to tip of the wings when extended, four feet six inches. Its weight was three pounds and fifteen ounces; but the other, which was smaller, weighed only three pounds. Its bill was of a pale red, tinged with dusky on the tip and sides: its head, neck, back, wings and tail were of a light ash-coloured brown, mottled with darker brown, the center of each feather being darkest: the rump and tips of the wing-coverts and tail were white; and the lesser wing-coverts, and bastard wing, of a light ash or slate colour, tipped with black; and the great quills dusky black: the whole under-side was of a dull white, clouded with light ash-brown, palest towards the belly and vent, which were of a dull white. Its legs and feet were webbed, and of a dirty yellow, with black claws.

Notwithstanding there was a considerable difference in the weight and dimensions of these two birds, yet I suspect that they were both young birds of the last summer, because even the largest was inferior

in

in weight and size to Mr. Latham's description; their bill and legs were of a paler colour than he describes them to be, and when dressed, their flesh was tender and well-flavoured.

No. 167.—The Scaup Duck. *Anas Marila*.

These birds frequent our sea-coast in hard winters. On the 27th of January 1795 my servant, in company with another person, fired amongst a flock of these birds consisting of near an hundred: he brought me a male and female; the latter proved to be the *Anas frenata* of Dr. Sparman's Museum Carlsonianum.

No. 168.—The Shieldrake. *Anas Tadorna*.

This bird is found on our coast both in winter and summer: that it breeds here I am confident, having frequently seen a pair of old ones, and also a brood of young ones taken at Bexhill.

I beg leave to lay before the Society a Continuation of my Tables of the Appearance and Disappearance of certain Birds.

A TABLE

	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	
Martin— <i>Hirundo urtica</i> . First seen - Not seen after -	Ap. 26 Oct. 14*	May 3 Oct. 28*	May 3 Sep. 30*	May 16 Dec. 8*	May 9	May 8 Nov. 2*	May 4 Oct. 21*	May 4 Nov. 1*	Ap. 21 Oct. 9*	May 3 Oct. 19	May 12 Oct. 24*																								
Sand Martin— <i>Hirundo riparia</i> . First seen - Not seen after -	July 15 Sep. 4*	— Sep. 2	Ap. 27 Sep. 6	Sep. 8 Nov. 5	July 19 Sep. 25	May 6 Sep. 29*	May 12 Aug. 21*	May 10 Sep. 23	Ap. 16 Sep. 1*																										
Swift— <i>Hirundo Apus</i> . First seen - Not seen after -	May 17 Oct. 14	May 4 Sep. 2	May 14 Sep. 6	May 15 Nov. 5	May 5 Sep. 10	May 5 Aug. 5*	May 19 Aug. 19	Ap. 28 Aug. 12	May 3 Aug. 10*	May 6 Aug. 2	May 13 July 19*																								
Goat-lucker— <i>Caprimulgus Europæus</i> . First seen - Not seen after -	Aug. 23	Sep. 9	—	—	—	—	July 11	Aug. 30 Sep. 4*	May 16 Sep. 14*	Sept. 2	July 6 Sep. 28*																								
Turtle-dove— <i>Columba Turtur</i> . First seen - Not seen after -	May 29	—	July 28	—	—	June 1 Aug. 2*	June 21	—	July 5	May 14 Aug. 10	June 14																								
Wynneck— <i>Jynx Torquilla</i> . First seen or heard Not seen after	Ap. 16	— Aug. 18*	June 30 Sep. 22	Ap. 12 July 6†	Ap. 17	May 5	Ap. 26	May 12	Ap. 3 Sep. 7*	Ap. 25 Oct. 18	Ap. 14 Sep. 8*																								
Cuckoo— <i>Cuculus canorus</i> . First seen or heard Not seen after	Ap. 26 June 19†	May 3 Sep. 28*	May 13 Sep. 6	May 7 June 22†	Ap. 16 June 17†	Ap. 27 June 19† Sep. 9*	May 10 June 19†	May 9	Ap. 15 June 19† Aug. 19*	Ap. 27 June 27† July 27*	Ap. 19 June 22† Sep. 19																								
Nightingale— <i>Motacilla Luscinia</i> . <i>Sylvia Luscinia</i> . First seen or heard Not seen after	Ap. 25	May 11	Ap. 25	Ap. 26	Ap. 16	Ap. 29	Ap. 26 Sep. 17	Ap. 13	Ap. 11 Sep. 24	Ap. 30	Ap. 21																								
Black-cap— <i>M. atricapilla</i> . <i>S. atricapilla</i> . First seen - Not seen after	May 18	— Sep. 8*	— Sep. 18	May 31	Ap. 17 Sep. 25	—	Ap. 24 Sep. 17	—	May 1 Sep. 24	—	—																								
White-throat— <i>M. Sylvia</i> . <i>S. cinerea</i> . First seen - Not seen after	Ap. 28 Nov. 11	May 3	Ap. 27 Sep. 23*	Ap. 19	May 1 Sep. 25	Ap. 29 Sep. 10*	Ap. 27 Sep. 17	Ap. 21 Aug. 30*	Ap. 14 Sep. 23*	Ap. 26 Aug. 26*	Ap. 23 Aug. 14*																								
Wheat-eat— <i>M. Oenanthe</i> . <i>S. Oenanthe</i> . First seen - Not seen after	Ap. 25 Nov. 11	Ap. 26	May 28 Sep. 22	Mar. 20 Oct. 18*	Ap. 12 Sep. 25	Ap. 10 Sep. 23*	May 3 Sep. 17	June 1 Sep. 22	Ap. 11 Sep. 20*	May 3 Sep. 25*	— Sep. 29*																								
Whin-chat— <i>M. rubetra</i> . <i>S. rubetra</i> . First seen - Not seen after	Aug. 4	Aug. 30	June 23 Sep. 19*	May 29	—	June 16	Aug. 11	Ap. 21 Sep. 23*	Ap. 21 Sep. 23*	May 23	Aug. 9																								
Redstart— <i>M. phœnicurus</i> . <i>S. phœnicurus</i> . First seen - Not seen after	Ap. 28 Aug. 30*	Ap. 28 Aug. 30*	May 19 Sep. 18	May 9 Sep. 26*	Ap. 23 Sep. 25	Ap. 28	Ap. 22 Aug. 18*	Ap. 12 Sep. 15*	Ap. 13 Sep. 20*	Ap. 25 Aug. 23*	Ap. 19 Sep. 21*																								
Willow Wren— <i>M. Trochilus</i> . <i>S. Trochilus</i> . First seen - Not seen after	Ap. 30 Nov. 11	— Sep. 8	Ap. 15 Sep. 23*	Ap. 13 Sep. 20*	Mar. 27 Sep. 24*	Ap. 28 Sep. 13*	Ap. 28 Sep. 17*	May 16 Sep. 20*	Ap. 6 Oct. 6*	Ap. 25 Sep. 26*	Ap. 14																								
Fly-catcher— <i>Mulicapa grilla</i> .																																			

<i>S. trochilus.</i> First seen - Not seen after -	Ap. 30 Nov. 11	— Sep. 8	Ap. 15 Sep. 23*	Ap. 13 Sep. 20*	Mar. 27 Sep. 24*	Ap. 28 Sep. 13*	Ap. 28 Sep. 17*	May 16 Sep. 20*	Ap. 6 Oct. 6*	Ap. 25 Sep. 26*	Ap. 14
Fly-catcher— <i>Muscicapa grisola.</i> First seen - Not seen after -	May 6 Nov. 11	June 12	May 15 Sep. 11*	May 16 Aug. 30*	Ap. 29 Sep. 25	May 13 Sep. 22*	May 16 Sep. 17	May 8 Aug. 22*	May 23 Sep. 30*	May 27 Sep. 4*	May 14 Sep. 22*
Red-backed Shrike— <i>Lanius Collurio.</i> First seen - Not seen after -	Aug. 16	May 18	—	—	Aug. 4	May 8	May 19	May 30	July 11 Aug. 1*	July 5 July 24*	July 6 Aug. 30
Land-Rail— <i>Rallus Crex.</i> First seen - Not seen after -	Sep. 4 Nov. 6	Sep. 3	Aug. 29	Aug. 27	Sep. 1	Sep. 4 Nov. 8	Sep. 1	—	Sep. 4 Oct. 8*	Oct. 15	Sep. 1 Sep. 26*
Quail— <i>Tetrao Coturnix.</i> <i>Perdix Coturnix.</i> First seen - Not seen after -	Sep. 3	Sep. 16	Aug. 29	—	—	Sep. 1	—	—	July 23†	—	—
Fieldfare— <i>Turdus pilaris.</i> First seen - Not seen after -	—	Nov. 6	—	Dec. 26	Oct. 13	Dec. 3	Nov. 3	Oct. 24	—	—	Jan. 6 Ap. 16 Dec. 6
Redwing— <i>Turdus iliacus.</i> First seen - Not seen after -	—	Nov. 9	Nov. 4	Dec. 31	Dec. 16	—	Nov. 2	Oct. 1	Oct. 8	—	Jan. 11 Mar. 8*
Woodcock— <i>Scolopax Rusticola.</i> First seen - Not seen after -	Oct. 6	Oct. 24 Ap. 5*	Oct. 19 Mar. 21*	Oct. 27 Mar. 21*	Oct. 21 Mar. 26*	Oct. 26 Ap. 6*	Oct. 13 Ap. 5*	Oct. 1 Mar. 14*	Oct. 3 Mar. 24*	Nov. 9 Ap. 4	Oct. 22 Ap. 16
Snipe— <i>Scolopax Gallinago.</i> First seen - Not seen after -	—	Nov. 30	Nov. 13	Nov. 26 Mar. 21*	—	Dec. 12	—	Nov. 30 Mar. 11*	Oct. 4	Nov. 22	Nov. 26 Mar. 18*
Jack Snipe— <i>Scolopax Gallinula.</i> First seen - Not seen after -	—	—	Jan. 5 Mar. 20*	Dec. 29 Ap. 9	—	Dec. 29	Nov. 12	—	Dec. 5 Feb. 25*	—	Jan. 29 Ap. 16
Sea Lark— <i>Charadrius Hiaticula.</i> First seen - Not seen after -	May 12	—	—	Feb. 19	Feb. 28	May 1 June 16*	Mar. 11	June 1	Ap. 11 Sep. 22*	—	June 11
Greater Tern— <i>Sterna Hirundo.</i> First seen - Not seen after -	May 12	Sep. 20	—	July 18 Sep. 15*	July 21 Oct. 25	May 8 Nov. 8	May 4	June 1	May 16 Sep. 18	July 24 Oct. 30	June 11 Sep. 29
Lesser Tern— <i>Sterna minuta.</i> First seen - Not seen after -	May 19	Sep. 20	—	—	Oct. 25	May 1 Nov. 8	May 4	June 1	Ap. 26 Sep. 18	July 24 Oct. 30	—
Roylton Crow— <i>Corvus Corvix.</i> First seen - Not seen after -	Oct. 13	Nov. 9	Oct. 7	Oct. 20 Mar. 21*	Oct. 25 Mar. 26*	Oct. 19 Mar. 5*	—	—	Oct. 16	Oct. 30	Nov. 13 Ap. 16

Those marked with an asterisk (*) were seen on that day, and not afterwards, till their return next season.

Those marked thus (†) were heard on that day, and not afterwards, till their return next season.



II. *Anecdotes of the late Dr. Patrick Browne, Author of the Natural History of Jamaica.* By Aylmer Bourke Lambert, Esq. V. P. L. S.

Read Dec. 1, 1795.

HAVING in a visit to Ireland in the year 1790 accidentally met with Dr. *Patrick Browne*, well known to this Society by his *Natural History of Jamaica*, I judged it might not be an unacceptable anecdote to give some account of my interview with this veteran in those pursuits which form the intentions of our meetings.

I first heard of him by the country people in the neighbourhood of Ballinrobe in the county of Mayo, at which place he lived. I sent him a message that I would wait on him. He was then so infirm that I found him confined to his room and his bed, but he received me with much cordiality when I told him my errand was to visit him merely from respect as a lover of the Science of Botany; and I gave him the first information of our institution, and the success that had hitherto attended our researches.

He conversed much on the subject of botany, and informed me that he had corresponded for twenty years with Linnæus himself, and had communicated many plants to him. Those Gentlemen who are at all conversant with the *Amœnitates Academicæ* will recollect, in the fifth volume of that collection, a paper under the title of *Pugillus Plantarum Jamaicensium*, in which the descriptions of 130 species are more correctly given than they stand in Dr. *Browne's* book. This was in consequence of Dr. Solander's having purchased *Browne's* whole collection, and sent it to Sweden for Linnæus.

And hence, in the *Species Plantarum* of 1764, Linnæus was enabled to correct both Sloane and *Browne* himself in many instances.

After Dr. *Browne*'s return from Jamaica, and the publication of his History, he took another voyage to the West Indies, where he resided, principally in Montserrat and Antigua, occupied in the practice of physic, for four years. He returned home for the last time in 1781.

Having much leisure during this stay in the islands, he collected a large Herbarium, and many seeds, which on his return he presented to Dr. Edward Hill, Professor of Botany in the University of Dublin.

He also began a *Flora Indiæ Occidentalis*, which formed a thin quarto volume; this he presented to me, and it is now in the possession of our President. I recollect, in speaking of this manuscript, that he told me he had taken uncommon pains to describe and discriminate the generic characters of the *Ipomæa* and *Convolvulus*; and that Linnæus had signified, in a letter to him, his approbation of the distinctions given of those genera.

I could not help remarking the small number of books that he seemed to possess on the subject of Natural History, his supellex being confined to the *Genera* and *Species Plantarum* of Linnæus, and a copy of Hill's edition of *Ray's Synopsis*, especially when I recollected the considerable number of authors he had quoted in his History of Jamaica; but he soon gave me to understand that in his last voyage he had the misfortune to lose his library, consisting of 200 volumes on Natural History subjects.

During my abode in his neighbourhood I paid him several visits, in one of which he made me a present of a MS. *Flora Hibernica*, and of a small Herbarium collected in the counties of Mayo and Galway, with a separate Collection of Mosses, which are now in the possession of this Society.

In

In my way to the Doctor I one morning found the *Cynofurus cæruleus* of Linnæus, which had escaped his notice, and of which he immediately gave a short description. This I have the pleasure of presenting to the Society, as a specimen of his hand-writing, and as the last description of a plant that he ever wrote.

When at Dublin, some time after I left him, I procured from Mr. Wilson the bookseller the letter I now produce, which was written a little time before his death. I produce it, not because it contains any very interesting information, but as a proof that to the last he preserved a wish to improve and propagate botanical knowledge. By this it appears too, that he had meditated to give all the assistance in his power towards the publication of the *Flora Hibernica*.

He received from me the first intelligence of the new edition of his History of Jamaica, and expressed a great desire to have seen it; but he died soon after, aged 70, and was buried at Crosboyne near Castle Macgarret in the county of Mayo.

Letter from Dr. Browne to Mr. Wilson Bookseller of Dublin, written a little while before his Death.

“MY design was only to give a simple and as cheap a Catalogue of the plants I met with here as I could devise. I mentioned it to Sir J. Banks, and he assured me he spoke to the Provost, and he promised to put a *Flora Hibernica* on foot. Such a Catalogue as mine might be of great service to such a work, and such a work alone deserves the embellishment and attention you mention. But it would require a visit to the south and north of the kingdom; undertakings by no means fit for infirmity at 70. However, by publishing small Catalogues, it might be brought about by individuals, and mine you are welcome to towards any thing of that sort.

Pultney's View of Linnæus I have not seen, and wish you would send it to me: I will get one of our carriers to call for it soon, and will be obliged to you to alter such English names as you see proper. As to the Irish, if ever you print it, put the Irish in Italicks only. I wrote them as much to the pronounciation of the Irish as I could, but not according to the Irish orthography, which I could not find in any book. *Paddowpipe* is undoubtedly the proper name of the *Hippuris*. I do not think the addition of *rush* proper to any name, and the method of adding a short character to the different genera (as in Linnæus's *Systema*) best, as in Martyn's of Cambridge. You mention the title-page: I think you ought not to publish more than a design of printing a *Flora Hibernica*, if such a thing could be completed, and of giving a Catalogue, in the cheapest manner possible, of such plants as have been collected for such an undertaking, with the English and Irish names, keeping the descriptions and remarks for a capital work. As to Theirlheld and K. Eogh's, I have had them, and think nothing of them. I lost all my books a few years ago: I had about 200 botanical books, and now I have only the *Genera & Species Plantarum* of Linnæus, with a copy of Ray's *Synopsis* in a Linnæan dress, which was the amusement of some time to me some years past. Lord Lucan promised to send me another copy of Dill. and Ray's *Synopsis*. If you could succeed in getting any other additions, so as to undertake a general *Flora Hibernica*, if I live and am able to stir I shall give you what assistance I can in the manuscript you have, which you may keep. *Ligusticum Scoticum* of that MS. is the *Smyrnum Olusatrum*.

"I have made out a Catalogue of our Agarics, for which this last season was very favourable, and it amounts to eighteen or more; but I have not this by me."

III. *Descriptions of three rare Species of British Birds.* By G. Montagu,
Esq. F. L. S.

Read March 1, 1796.

I. SYLVIA SYLVICOLA.—WOOD WREN.

*S. virescens subtus flavescens, superciliis luteis, abdomine cristoque
niveis.*

Afalus major, Briss. orn. 3. p. 482. A.

*Regulus non cristatus major, Will. orn. p. 228.—White, Hist. Selb.
p. 55.*

Laubvögelchen, Naturf. 27. p. 47. 4.

Wood Wren, Linn. Transf. 2. p. 245. pl. 24.

IN the latter end of April in the year 1790, as I was walking with my gun, I was attracted by the note of a bird I had never before noticed, and presently discovered it on an oak-tree, at the verge of a wood in the parish of Easton Grey in the county of Wilts. The first appearance of the bird much resembled that of the Yellow Wren, *Motacilla Trochilus*; but its note and manners at once decided it to be a very different species. It is an active restless bird, and, at the time I shot it, was excessively busy in pursuing some species of winged insect, which seems to be its principal food. Upon near inspection it might readily have been mistaken for the

Trochilus, had I not been attentive to its note and actions. Having recollected that Mr. White, in his Nat. Hist. of Selborne, page 55, speaks of three distinct species of Yellow Wrens, I concluded this to be one, as doubtless the *Motacilla Trochilus* and *Motacilla Hippolais* are the other two. In order therefore to compare those with this species, I shot fresh specimens, with which that country abounds, and by which I was thoroughly convinced they were distinct; and in all probability this is the identical bird Mr. White calls the Largest Yellow Wren, and describes as inhabiting the high woods of beech at Selborne.

As this elegant little species of warbler seems to have escaped the notice, or at least the historic attention, of ornithologists, probably from confounding it with the Yellow Wren, it was my intention to present it to the Linnean Society as soon as opportunity offered the discovery of its nest and eggs, in order that it might be added to the list of British birds. In a tour through South Wales the following spring, I found this species not unfrequent in the oak woods of Carmarthenshire. The first I saw that season was on the 29th of April, the thermometer at 51 at 9 o'clock A. M. and, in a week after, a great many more arrived, which, from their incessant chirping and actions, I took to be all males. About the middle of May I plainly discovered some females were arrived, and on the 30th of that month I had the good fortune to find two nests, by watching the birds with some of the materials in their bills, and soon after took them with six eggs each; and in order to clear the matter beyond doubt, I caught one of the females on the nest, and shot the male, who approached very near, at the same time. It may not be improper to remark, that I found these birds in greatest plenty in coppice woods of oak of about eighteen or twenty years growth: their flight is short, slow and vibrating, as they move from spray to spray, seldom varying their situation above twenty yards

yards from the first chosen spot till the young take wing, when they quit the lower branches, and take to the highest trees, searching for insects amongst the upper foliage. At this time they are not so vociferous, and have entirely left off that constant vibration of their wings, which seems peculiar to the courting and incubating season.

It is not to be supposed that this species is a new or accidental visitant to these parts, but that its near resemblance in size and colour to the Yellow Wren has probably occasioned it to be mistaken for that bird. But whoever will bring them together will at once observe, that the plumage of this is much more vivid; the stroke above the eye of a much brighter yellow; and, as a special characteristic mark, the belly and under tail-coverts are invariably of a pure white, which in the Yellow Wren are tinged, and the latter part dashed with yellow. There is no distinction in the plumage of the sexes of either species: this should not therefore be mistaken for the male of the other, which doubtless has often been the case; neither should it be confounded with the *Hippolais*, that bird being much inferior in size, and none of the under parts of a pure white: its legs are also dusky, in which it differs from both the *Sylvicola* and the *Trochilus*. Besides, were every other mark of distinction wanting, the note, manners and habits of this widely differ: this only inhabits woods in the breeding season: its cry, for it cannot be called a song, bears not the least resemblance to any other species: the first part seems to express the word *twee* drawn out to some length, and repeated five or six times successively, terminating in notes something of the same tone, but delivered in a hurried manner, shaking its wings at the same time. This species weighs about two drams forty grains; the length five inches and a quarter: the bill is dusky; irides hazel: the upper part of the head, back, scapulars, and upper coverts of the tail, are of a lively yellow green:

over

over the eye is a bright brimstone-coloured stroke; the cheeks and throat yellow; the upper part of the breast, white tinged with yellow; the lower part, belly, and under tail-coverts, pure white: the quill feathers are dusky, edged on their exterior webs with yellow green; the tail very little forked, coloured like the wing feathers, except the two outmost, which want the yellow margin: the legs are of a yellowish brown.

The female caught on the nest weighed three drams.

This bird is a migratory species, and like most, if not all our summer migrants, the males precede the other sex in their vernal flight a week or ten days. It leaves us about the middle of September.

The nest is formed on the ground, beneath the shade of trees or bushes, constructed of dry grass, with a few dead leaves and a very little moss externally, and lined with finer grass and a few long hairs. Its shape is oval, with the entrance near the top, like those of the Yellow Wren and Lesser Pettichaps; but materially differs from them in the internal part of its structure, as those birds invariably line their nests with feathers. The eggs weigh from eighteen to twenty-two grains; their colour white, sprinkled all over with rust-colour spots: in some those markings are confluent.

These observations were intended to be presented to the Linnean Society immediately after the discovery of the nest and eggs; but, by some unaccountable means, my notes were mislaid: this delay gives me the opportunity of seeing the same bird described by Mr. Lamb in the second volume of the Linnean Transactions, p. 246; but as neither the female, nest, eggs, or place of nidification is mentioned, I have thought proper to retain the original form of my notes, especially as Mr. Lamb makes mention of my name as having noticed the bird first to him under the denomination of Wood Wren, which name he has retained. I cannot, however,

take upon myself the merit of its first discovery as a British species : that properly belongs to Mr. White. I have, however, fortunately been enabled to investigate its history more minutely ; the only inducement at this period to lay it before the Society. This bird is also found in Germany, where it is likewise a migratory species, as we are informed by Dr. Beckstein in the 27th volume of *Naturforscher*, p. 38, where he gives a description of such of the *Motacilla* species inhabiting that country as have a yellow streak over the eye.

To my friend Mr. Latham I am indebted for the translation of that part of the work for my inspection, where I find under the denomination *Der Laubvögelchen* *, p. 47, No. 4, an excellent description of this bird and its manners ; though the author does not seem acquainted with the nest and eggs. He adds (*Motacilla Sibilatrix*) superciliis luteis, supra virescens, subtus flavescens. This author particularly remarks the whiteness of the under tail-coverts, the strong characteristic mark of distinction.

After what has been said of this hitherto little known beautiful species of warbler, little can be added to elucidate its history : to my former remarks I can only say, that since my intimate acquaintance with the bird, I have met with it in plenty in all the southern counties and wooded parts I have been in, especially where oak or beech abound. To this I have taken the liberty of adding a coloured drawing of the egg, taken from those in my own collection †. See *Tab. 2. fig. 1.*

* Little leaf-bird.

† I met with this bird in Parkinson's Museum under the title of Green Wren, case No. 271.

2. TRINGA

2. TRINGA NIGRICANS.—PHAYRELARN SANDPIPER.

Tr. cinereo-nigricans, gula abdomineque medio albis, rostro basi pedibusque rubris.

THIS non-descript species of *Tringa* was killed at Larn, or Lougharne, on the coast of Carmarthenshire in Wales, January 20, 1792, and presented to me by my friend Robert Phayre, Esq. which induced me to give it the above trivial name. It was shot in company with its congeners the Purre (*Tringa Cinctus*), &c. All I could learn was, that, at the time it was killed, the weather was very severe, and that two others had been shot there the same season, and were called by the fishermen *Red-legs*.

In size it rather exceeds the Purre: the length was eight inches and a half; the bill slender, an inch and a quarter long, tapering towards the point, a little curved, and of a dull red colour, except at the apex and sides; the irides hazel; the head and neck dusky black; eye-lids whitish; the throat white; back and scapulars black, edged with ash-colour; the wing-coverts black tipped with white; quill feathers black, slightly edged with white on the exterior webs; shafts white; breast and all beneath white, prettily spotted with black, except the middle of the belly and vent; the rump black; the two middle feathers of the tail black, the outer one cinereous, and the rest dusky; the legs and toes dull red; claws black and blunt; toes nearly divided to their origin; middle toe an inch long.

This bird is now in my collection, from which I have taken the figure annexed, *Tab. 2. fig. 2. **

* Mr. Latham suspects this may possibly be the Purple Sandpiper figured by Mr. Walcott in his second volume of *British Birds*.

3. ALAUDA

Sitta carolinensis. lat. 2. p. 10.





3. ALAUDA PETROSA.—ROCK LARK.

A. olivaceo-fusca subtus flavicans, lateribus colli pectoreque fusco maculatis, rectrice extima albo dimidiata.

Alauda obscura, *La. Ind. orn.* 2. p. 494. 7.

Dusky Lark, *Lewin's Br. birds*, vol. 3. pl. 94.

HAVING been favoured with a species of *Alauda* a few years since, from that excellent ornithologist Mr. Latham, amongst others of the same genus, in which he honoured me by a request of my opinion as to their distinction, I did not hesitate in acknowledging my being wholly unacquainted with this bird; but I took the liberty of pointing out such specific differences from all other British larks, as might obviate the idea of its being only a variety of some other species. It was the only one that gentleman had ever seen, and was sent to him by Mr. Lewin. As no description of it could be found in any author, I gave it the name of the Dusky Lark, for distinction; which name Mr. Lewin afterwards adopted in his publication on British birds, vol. iii. No. 94, as well as Mr. Latham in his *Ind. orn.* vol. ii. p. 494—7. In the year 1791 I discovered this bird to be a native of the coast of South Wales, from Monmouthshire to St. David's, the extreme part of Carnarvonshire, in all the rocky situations. Upon enquiry of the natives, I found some of the fishermen knew it by the name of the Rock Lark, and that it was indigenous to those parts: this name therefore I continue it by, instead of Dusky Lark, being expressive of its habits. As I had an opportunity of seeing these birds daily, I thought myself fortunate not only in proving, beyond all doubt, that it was a British species, but also in being able to investigate its natural history, and with certainty to add another bird to the catalogue of this country; and my wishes were fully accomplished by finding several nests with eggs. There is some reason to believe Mr. Pennant had met with

this bird many years before it was given to the world as a distinct species by Mr. Lewin; for, in his folio edition of British Zoology, pl. P i, he has given what he calls a variety of the Tit-lark (*Alauda pratensis*) with dusky legs, shot on the rocks on the coast of Carnarvonshire. Should this prove to be the same bird, of which I believe there is no doubt, it does not detract from the merit of Mr. Lewin, who first gave it as a distinct species, but only serves to shew the slow progress of light upon Natural History. That gentleman, however, did not seem acquainted with the particulars of its history. This circumstance has induced me to lay before the Society the fruits of my further discovery respecting it.

The Rock Lark only affects the rocky parts of the coast: where the sandy flats intervene it is not to be met with, except in winter, when it is occasionally found in the marshes, but seldom, if ever, out of the influx of the spring tides; from which we may conclude its food is principally marine insects. Early in the spring it begins its song, which much resembles that of the *Alauda pratensis*, mounting in the air like that bird, and returning again to the ground, or some neighbouring rock, with motionless wing. It begins breeding early in the spring: on the 16th of April I found a nest with five eggs: it was placed upon the shelf of a rock, about fourteen feet from the ground, behind a tuft of coarse grass, beneath a small bush. The nest is formed of dry grass, marine plants, and very little moss externally, and lined with finer grass, and a few long hairs. The eggs are of a dirty white, sprinkled with numerous specks of brown, darker and confluent at the larger end, so as to appear on that part wholly brown: their weight is about 36 grains.

The bird weighs about seven drams; the length six inches three quarters. The bill is dusky, near seven eighths of an inch long from the apex to the corner of the mouth; irides hazel; the upper part of the head, back of the neck, and tail-coverts, are of a dark brown;

brown; the back and scapulars of the same colour, obscurely marked with dusky strokes; above the eye, and beneath the ear, is a lightish-coloured stroke; the throat whitish; the breast and belly yellowish white, the former blotched with large dusky spots; the sides marked with strokes of the same; under tail-coverts light brown; the two middle feathers of the tail dark brown, the others dusky,—the outer one of a dirty yellowish white on the interior web and the point of the exterior,—in the second feather the light colour is just visible at the end; the quill feathers and wing-coverts are dusky, slightly edged with light brown; legs and toes dusky; claws black; hind claw four tenths of an inch long, and somewhat crooked. The female resembles the male.

The young birds are not maturely feathered till after the winter of their first year; till then their upper parts have a tinge of olivaceous ash-colour; beneath, the lighter parts are yellowish, and the coverts of the wings more deeply margined with light brown: the base of the under mandible and legs less dusky.

I have lately observed this bird on the coast of Kent and Suffex.

Mr. Lewin having published a figure of this bird already, its egg only is here delineated, *Tab. 2. fig. 3.*

IV. *Account of some Species of Fossil Anomia found in Derbyshire.* By
Mr. William Martin, F. L. S.

Read April 5, 1796.

AMONG the petrifications of Derbyshire, which I have been drawing and describing for some time past, there appear to me none more worthy of a careful examination than those fossil shells, generally referred by authors to the family of *Anomia*: the variety of form the different species exhibit, and the prodigious quantity of some of those species our limestone *strata* afford, must strike even a casual observer as curious circumstances, and certainly well deserve the attention of the Naturalist. Though my own researches, in regard to this genus of fossil *exuviae*, have been indirect and imperfect, it has chanced that a great variety of specimens, within this year or two, has passed through my hands: among these I reckon near thirty distinct species, several of which seem to have escaped the notice of authors. The *Anomia* delineated in the annexed tables, is one I suppose to be as yet undescribed. It appears to have been a curious shell; its form is very singular; and the *perforation*, which is placed in what is commonly called the *upper valve*, differs from that of every other fossil species I have yet seen, in respect to its superior size, as well as its situation.

DESCRIP-

DESCRIPTION.

ANOMIA (cuspidata), testa conica fulcata: valvula altera convexa, nate incurvata: altera pyramidata, magno foramine trigonali. *Tab. 3.*

Sharp-pointed conical Anomia.

The *general figure* of this shell is conical.

The *beaked* or *under valve*, as it is usually called, is convex, broad (its greatest extent being from side to side), and wrought with longitudinal ribs, which are closely set, thick, prominent, and crossed by a few slight concentric wrinkles, marking, apparently, the growth of the shell. The middle rib is much larger than the rest, forming a high convex ridge down the centre of the valve, increasing in breadth from the beak to the margins, which in that part are undulated or waved. The number of ribs, including the middle one, about twenty-nine. The *beak* is small pointed, and curved over the hinge.

The *hinge* lies on a perfect straight line, extending the whole breadth of the shell.

The *upper valve* is pyramidal, gradually tapering from a broad base, formed by the other valve, to a fine point or *apex*, which is the centre or middle part of the valve produced and acuminate. The *back*, or that portion of the *pyramid* proceeding from the margins, is rounded, longitudinally ribbed, and indented with a deep concave groove or *fulcus*, correspondent to the ridge in the under valve. The groove and ribs are crossed by a few strong but distant wrinkles. The *front*, or that part which extends from the hinge to the *apex*, is flat, smooth, and perforated; in figure it nearly approaches to an equilateral triangle. The *perforation* is very large; it runs through the middle of this side of the valve, and resembles

a long perpendicular flit or fent. Its greatest breadth is at the hinge, from which it gradually diminishes to a point.

This species is very rare: I have only met with one perfect specimen, which was found at Castleton, in the common, hard, grey limestone. It is a complete change, evidently retaining the external shape and markings of the original, which has been displaced by limestone, similar to that in which the fossil was lodged. The same kind of stone, also, and spar blended together, constitute the interior part of the specimen, and fill up the aperture in the front of the conical valve.

EXPLANATION OF THE FIGURES.

TAB. III

Contains different views of the *Anomia* described above: the figures the exact size of the specimen from which they were taken.

Fig. 1. A full view of the *under* or *beaked* valve.

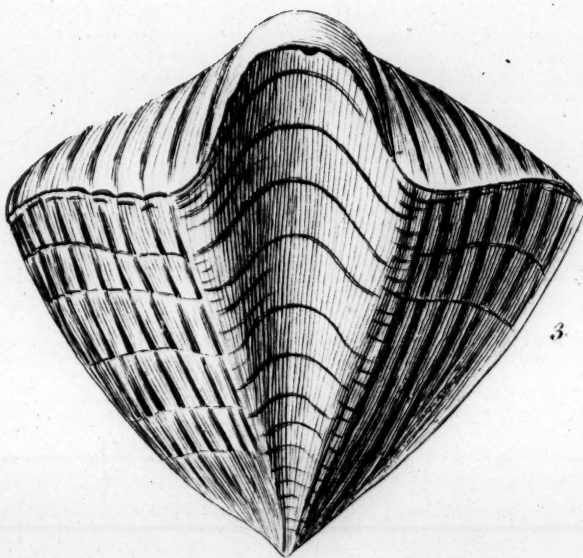
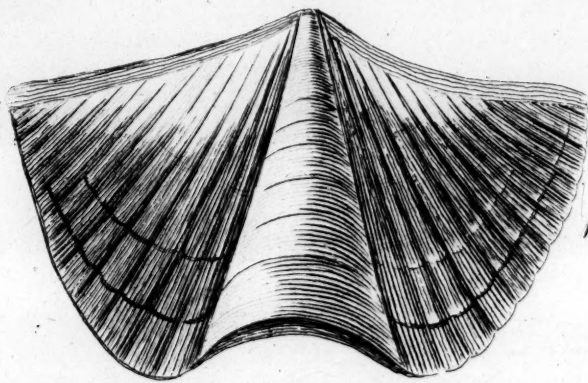
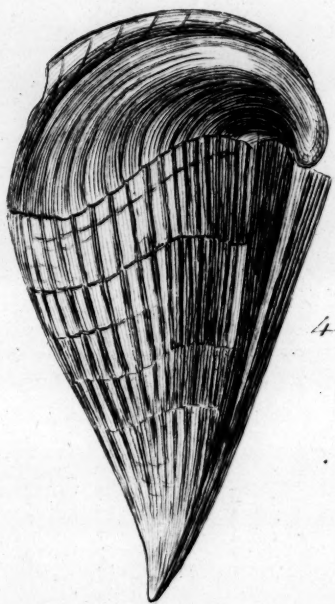
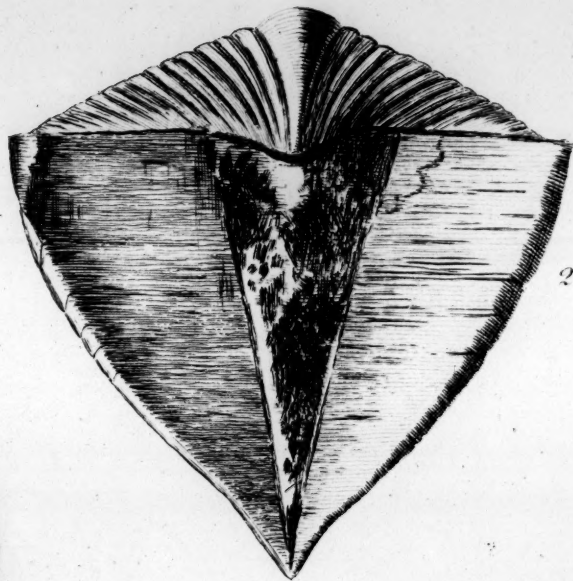
Fig. 2. Represents the specimen placed in a proper position for shewing the *hinge*, with the *beak* of the *under* valve*, and the flat perforated side of the *upper* or *conical* valve.

Fig. 3. An opposite view, shewing the back of the conical valve, with its deep groove or furrow, and the undulation of the margins.

Fig. 4. A side view of the same specimen.

Observation. It seems probable that this shell, in a recent state, adhered by the flat perforated part of the larger valve to some other body. I believe the few living *Anomia* which are known, are al-

* It is proper to remark, that what is called the under valve forms the upper part of fig. 2, 3, 4. the position in which they are given appearing most agreeable to the general make of the shell.







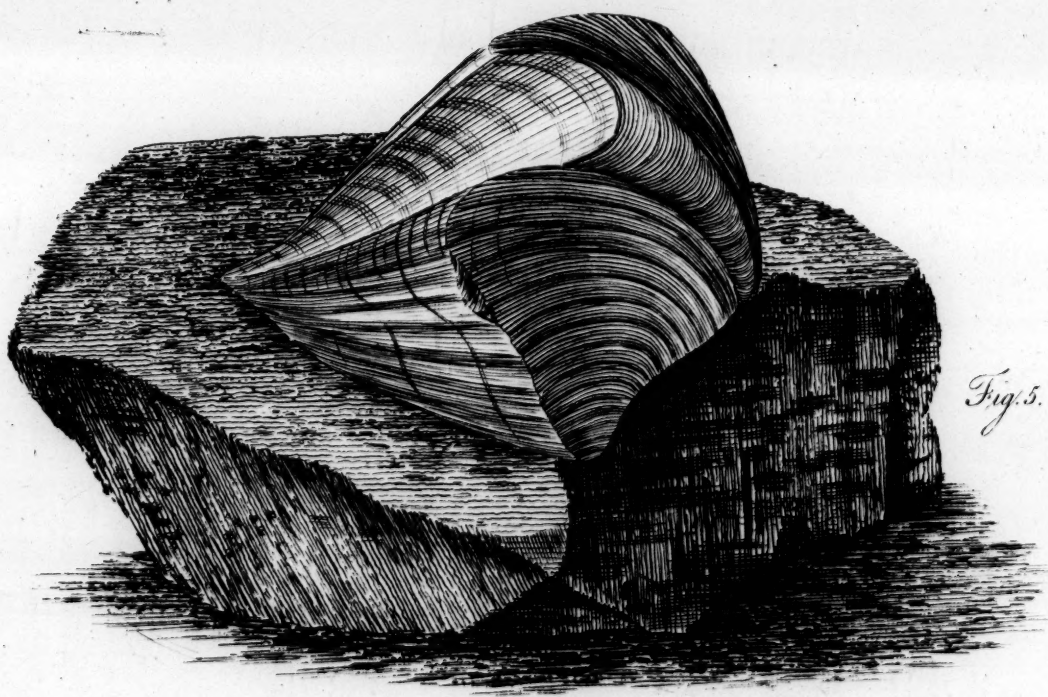
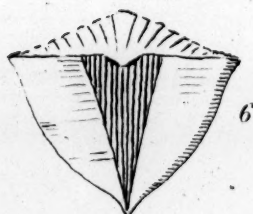
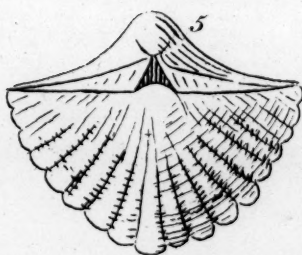
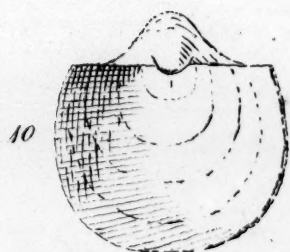
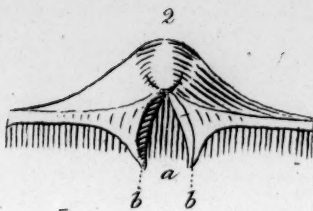
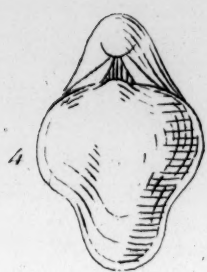


Fig. 5.



ways found fixed to stones, corals, &c. by a strong tendinous ligature, that passes through their perforated beaks. In this species it is evident, from the apparent size of the aperture, that a large portion of the included animal was left bare, which, instead of a ligament, might have been furnished with a strong adhesive power, similar to that enabling limpets, and some other univalves, to stick to rocks, &c. In Tab. 4. I have given a sketch of the shell thus fixed: it will help to elucidate the idea I have formed relative to its recent state; and, as the position of the figure differs, may assist the explanation of the other figures,

TAB. IV.

The large figure in this table (5*) has been already noticed: the small figures are explanatory of a few remarks I beg leave to offer on the *hinge* and *perforation* of the *Fossil Anomia*, together with a sketch of an arrangement which will include all the different species yet collected in Derbyshire.

Of the Hinge.

It has been supposed that the *Anomia* whose hinge is on a straight line, like that of some of the *Arcae*, were in a similar manner mult-articulate, or furnished with many teeth: but perhaps this is not the case:—in all of them I am sure it is not. The most perfect extraneous fossil I ever saw, was a *single* valve of a square-hinged *Anomia*: it retained its shelly nature, with little or no change, and the hinge was quite entire and distinct. In this, however, as well as in many less perfect petrifications of single valves of the same kind I have occasionally met with, I could never discover the least appearance of a multarticulate connexion. Indeed from what I have been able to observe it should seem, that the *cardo* in the straight-hinged fossil *Anomia* is the same, in many respects, as that of the recent species,
namely,

namely, a cavity or notch under the beak of the larger valve furnished with two small lateral prominencies; and in the smaller valve a projection that corresponds with the notch and hollows that receive the prominencies just mentioned. But of this a better judgment may be formed by comparing Tab. 4. fig. 1, the top of the under valve of an *Anomia*, known in the recent state, and also found in great quantities fossil, with fig. 2, a correct drawing of the same part of a petrified single valve of the straight-hinged kind. In this last the cavity *a* (forming when the valves are united a triangular aperture between the beak and hinge), and the pointed processes *b, b*, may perhaps answer the purpose of the notch *a*, and lateral prominencies *b, b*, fig. 1, though greatly differing in shape. That this is at least probable will appear, if we examine fig. 5, which represents the petrification, fig. 2, as commonly found, of solid limestone, with the valves joined. Here it is evident a part of the cavity, with the processes * *b, b*, of fig. 2, are covered by the upper valve, the hinge of which, as in the recent *Anomia*, I suppose to be indented into the bottom of the notch, and furnished on the inside with hollows answerable to the prominencies in the other valve. Before however the whole internal structure of the fossil straight-hinged *Anomia* can be properly determined, it will be necessary to examine a perfect, detached *upper* valve, which I have never yet been fortunate enough to meet with.

Of the Perforation.

Some authors, in their definition of an *Anomia*, have constituted the perforation as the leading or essential character of the *genus*, and have even confined it to a particular part of the shell—the

* In a specimen of a single valve which I have lately met with, these processes are not straight, as in fig. 2. their points being curved inward, towards the hollow of the valve, so as to resemble hooks.

beak of the larger valve. It is not however constantly placed in that situation, as one of the recent subjects, the *Anomia Ephippium*, Lin. Syst. p. 1150, and the fossil described in the preceding pages, evince. Nor does it appear that it should be considered as a principal or determinate characteristic of this family; for in examining some hundred specimens, similar to those represented by fig. 7, 8, 10, as well as all the different species which come under the divisions those figures elucidate, I have not been able to detect the smallest aperture in either of the valves, though many of the specimens were far more perfect than some of those in which the perforation is always sufficiently visible. I am well aware that some of these imperforate *Anomia* would be ranked by Conchologists, who esteem the aperture as the leading character, under another genus; for instance, the *Anomia Gryphus*, and other species of a like form, with the *Ostreæ*. But though there may be some doubt respecting the family to which the fossils in question properly belong, certainly there is no genus yet established, except *Anomia*, that will receive those imperforate bivalves represented by fig. 7, 8, 10. Must we therefore form a new genus for the subjects under consideration, or adhere to the definition of an *Anomia* Linnæus has left us, in which the perforation is not, I think, considered as a constant generic character? Perhaps till more accurate investigations prove the hinge (from which without doubt the leading character in every family of bivalves should be taken) in the perforated *Anomia*, to differ from that of the imperforate, it will be advisable for those who are engaged in the pursuit of extraneous fossils to consider *all bivalves with unequal valves, the beak of one being produced or more prominent than that of the other (generally the smaller valve), and for the most part curved over the hinge, as belonging to the genus of Anomia.*

An Attempt towards an Arrangement of such Anomia as have been collected in Derbyshire.

I. Imperforate;

Or those which have no visible hole or perforation in either valve.				Number of Species collected in each Division.
— — —	with one valve gibbous, the other flat or concave.			1
— — —	hinge rounded, or not on a straight line. Fig. 9			
— — —	hinge on a straight line. Fig. 10	-		7
— — —	with both valves convex.			
— — —	hinge rounded, or not on a straight line.			
	margins even. Fig. 8	-	-	3
	margins waved. Fig. 7	-	-	3

Perforate;

Or those in which one of the valves is pierced with a hole.				
— — —	with both valves convex.			
— — —	hinge not on a straight line.			
	the beak of the larger or under valve pierced through like a tube. Fig. 3. 1			4
	a triangular aperture between the beak of the larger valve and hinge. Fig. 4			6
— — —	hinge on a straight line.			
	with a triangular aperture under the beak of the larger valve. Fig. 2. 5			4
	with the upper valve perforated. Fig. 6			1

I have at present no more to offer on these subjects. At some future period I shall be happy in having permission to lay before the Society sketches of the other *Anomia* remaining in my hands, which are judged to be non-descript.

V. *Essay on the Eye-like Spot in the Wings of the Locustæ of Fabricius, as indicating the Male Sex.* By Professor Anthony Augustus Henry Lichtenstein, F. M. L. S.

Read May 3, 1796.

INTER insecta, præ ceteris curatiore digna sunt consideratione *Locustæ* sensu latiore; siue illæ species *hemipterorum*, quas immortalis Linnæus communi nomine generico, *gryllos* appellat. Fabricius vero, quem, pro solidissimo entomologiæ systematicæ conditore, venerari fas est, tamquam ad diversa genera: *acridium*, *truxalis*, *acheta*, *locusta* et *gryllus*, pertinentes, a se invicem segregavit, et subtiliore methodo descripsit. Plurimum enim nostra omnium interest, ut præsertim discamus naturam atque indolem eorum animalium, quotquot humano generi proxime, vel ad usum fructuosa sunt, vel rursus perniciofa et ad noxam damnifica reperiuntur. Jam vero haud facile alius ordo naturalis insectorum, arctiori nexu cum œconomia copulatus cohæret, dum vitæ humanæ commodis in omni terrarum orbe obest, passim vero etiam, utpote quem inter cibos recipere, multæ gentes dignantur, idem simul prodest, quam *Ulonata* Fabricii, et quidem præcipue, quotquot eorum pedibus saltatoriis instructa sunt. Non sine adflatu divino præclarus ille Israëuitarum legislator, Moses, quum suo populo præcepta circa cibos traderet, atque omnium reliquorum insectorum volatilium usu, cives Hebræos interdiceret, blanda duntaxat alimenta a *gryllis* desumenda illis concessit, ac folis *ulonatis saltatoriis* vescendi veniam dedit. “Omne insectum alatum,” inquit *Levit. xi. 20. seqq.* “quaternis pedibus in-

“grediens, abominandum vobis esto. Solummodo ista comeditote
 “ex infectis alatis, quæ quaternis pedibus ingrediuntur, quotquot
 “habent duo crura præter suos pedes, quibus saltent super terram.
 “Sequentia ex illis comeditote: *gryllum* ejusque species, *locustam* se-
 “cundum ejus species, *truxalidem* secundum ejus species, et *achetam*
 “secundum ejus species.”

Neutiquam est, cur miremur, antiquissimum illum auctorem jam in quatuor genera dispecere istius modi infecta, et singulorum horumce generum plures agnoscere species. Quem ad modum enim ignoti nulla cupido; ita rursus noscitare, domique perspicere amant homines naturam illarum rerum, quas pro victu cupediisque usurpare consueverunt. Hinc factum est, ut historia naturalis ulonatorum adfultim ingredientium in oriente percrebresceret multis seculis ante, quam Europæi spreta isthæc sibi fastidiataque monstra, propius considerare et notis peculiaribus a se invicem distinguere sustinerent vel dignarentur. Tametsi vero nunquam in omni Europa, quantum equidem sciam, usquam ille Asiatis Afrisque solemnis mos, locustis vescendi obtinuerit, aut olim facile unquam in consuetudinem abiturus esse videatur: nihilo secius tamen illud insectorum genus, vel eo nomine solertem attentionem meretur, quod identidem agros pessimis exemplis devastans, magnam calamitatem infert rei rusticæ. Quam ob rem tot tantique exstant singulares de locustis libri, totiesque obiter, et quasi aliud agendo, de iisdem exposuere docti homines, modo agricolis, nunc naturæ curiosis consulturi, ut noctuam Athenas inferre putetur, si quis novi aliquid et inauditi de hoc insectorum genere docere præsumat. Verum tamen manet inexhausta dives illa naturæ vena; et immane quantum adhuc restat indagandum, circa bestiolas, falso pro jam fatis superque cognitis habitas. Sed qui recens patefactis naturæ mysteriis, locupletare cupit litterarum studia, næ ille vehementer errat, ubi ultro sibi manifestatum iri sperat ea, quæ celavit ad hunc usque diem solers opifex,

fex, nusquam nisi in minimis tota natura, curiosos, sed parum oculos cordatosve observatores, perfunctorie supinaque oscitantia tractantes intricata structuræ animalis miracula. Dicitur, quin animo fingi vix potest, quantum per omnem subsidiorum litterariorum apparatus, adhuc lateat in adumbrationibus generum et formarum, quæ ad ulonata pertinent, rite constituendis. Contigit mihi, *gryllos* et *locustas* in ditissimo museo Holthusiano improbo labore examinanti, errores quosdam investigare, qui viros in entomologia versatissimos induxerunt, ut notas et characteres genericos cum specificis confunderent, et meras diversitates e sexus discrimine ortas, pro specificis proprietatibus adhiberent. Sic tribuit Linnæus numquam nisi honorifice nominandus, *Gryllo succincto* gulam cornutam, quasi characterem speciei, id quod recentiores entomologi, ejus auctoritatem temere secuti, uno ore confirmant. At cuncti *grylli* Fabricii habent cornu, longius vel brevius in gula; eoque tamquam characterem naturali generico liquidissime a *locustis*, *achetis*, *truxalidibus* et *acridiis* distinguuntur. Ex hoc abusu characteris generici, pro nota specifica, non potest fieri, quin oriantur errores, excusandi quidem, sed nihilo minus emendandi. Plurimum reverendus Herbst (*Archiv. inf. tab. 54. fig. 2.*) exhibet iconem *Grylli Lineolæ* Fabric. n. 29. sub nomine *Grylli succincti*, propter gulam cornutam. Quis hoc illi vitio vertere potest, quum nemo usquam annotaverit, omnes omnino species *grylli* Fabriciani communiter gaudere hacce tali protuberantia corniculata, nunc recta, nunc incurvata, modo longiore, modo brevior, nunc ferrata, nunc integerrima? Nondum conjectura adsequi valui, cui bono natura tribuerit hanc partem peculiarem *gryllis*, et quidem hisce solis. Nihil profecto frustra vel temere creavit, nil molitur inepte Numen sapientissimum. Docebit olim experientia, quo valeat isthæc singularis gulæ in *gryllis* Fabric. conformatio. Sed de hoc nunc quidem hætenus.

Tranfco.

Transeo ad aliud argumentum circa *locustas* Fabricii, quod, tamquam propriam et primariam hujus schediasmatis materiam, ita pertractare conabor, ut quantum inde, non modo ad hujus generis species rite definiendas, verum in universam adeo entomologiam utilitatis redundet, manifesto appareat. Pertinet verò hæc recens observatio ad ocellum dorsalem in basi hemelytrorum, quem clarius, vel item occultius conspicuum, gerunt mares omnium formarum, quæ merito sunt referendæ ad genus naturale, quod Fabricius sub nomine *locustæ* constituit, sive ex disciplina Linnæi ad illam tribum *gryllorum*, quam *Tettigonia* inscripsit. Quum in supra laudato museo, ea, qua par erat sedulitate, *locustas* examinarem, ut unam quamque vindicarem suæ propriæ et genuinæ speciei, nomineque debito insignirem: incidi quoque in exemplaria, quorum hemelytra juxta basin ocello fenestrato perquam distincte notata reperirentur. Simul atque hoc animadverti, ultro nimirum delatus sum ad illas locustarum species, quibus sagax naturæ interpres Fabricius nomen ex hoc caractere imposuerat, videlicet ad locustam perspicillatam, specularem et perforatam. Sed mox edoctus sum, hanc species hujus generis determinandi viam, in errorem citius, quam ad veritatem perducere. Primum enim incidi in specimina, tali ocello speculari prædita, sed alioquin a characteribus reliquis apud Fabricium enumeratis, toto cœlo diversa. Deinde manifesto deprehendi alia exemplaria, penitus illis, ocello dorsali vitreo notatis conformia, præter solum hunc ipsum ocellum; aut caudam ensiferam, pro certo caractere sexus feminini gerentia. Illicet animus tulit, librorum abjicere suppellicem, viamque proprio studio pandere, atque ex labyrintho fugam quærere, ope logices artificialis, quæ instar fili Ariadnei, fida superat, errores proprios alienosque relecturo, dux atque magistra, ubi magna pars litteratorum hominum, et præsertim naturæ curiosorum, Pythagorico more, cum haud sordidis naturæ verique auctoribus in alia omnia descendere, quam sibi sapere, suæque sponte, abditam perplexis

plexis latibulis veritatem investigare, mavult. Postquam ex inductione, incompleta illa quidem nimirum, attamen multorum exemplorum, mihi constitit, ocellos illos dorsales juxta basin hemelytrorum, in folis maribus *locustis* exsistere; contra vero feminas, ense partumeio in hoc genere facile adgnosendas, semper exhibere basin illam planam ac simplicem: oppido intellexi, sæpe jam commemoratos ocellos, utpote constantem et peculiarem masculæ fortis notam, nulla ratione pro caractere specifico in hoc genere posse adhiberi. Alios igitur profecto characteres anquirendos esse, in sexum sequiorem pariter quadraturos. Mox unde oriantur ocelli, quove ex mente optimi maximi creatoris spectent investigare sustinui. Hoc agens ingressus sum speculationem, quam a tot sagacissimis entomologis huc usque neglectam fuisse miror. Omnia nempe insecta, quæ *hemiptera* nuncupare Linnæo placuit, dummodo non omnino carent elytris, gerunt hemelytrum dextrum, qua marginem baseos internum, sub interno margine baseos hemelytri sinistri reconditum. Hæc ratio latius valet, ultra *gryllos* et *locustas*, non modo *Ulonata* cuncta, verum etiam *Rhynchota* Fabricii pleraque, sub communi formula complectens. Donec nempe hemelytra illa, sive hemipterorum elytra, in situ naturali jacent, neque externa quadam violentia loco suo mota sunt, neque ad volandum expansa: semper basis elytri dextri, qua partem internam, sub margine interiore baseos elytri sinistri latet. Hinc emendandus est character artificialis ordinis hemipterorum, sub quo duo ordines naturales *ulonatorum* et *rhynchotorum*, ex disciplina Linnæi militant. Vera enim et unica omnium illuc relatorum congruentia, in eo consistit, quod basis elytri sinistri tegit marginem anteriorem baseos elytri dextri. Si fatendum, quod res est, paucissima modo insecta hemiptera sunt prædita veris hemelytris, sive alis superioribus elytris dimidiatis, vel uno certoque sensu femicoriaceis. Longe enim diversa ratio est, utrum elytra sint versus basin coriacea, sed versus apicem pellucida, veluti in cimicibus; an vero tota quoad
sub-

substantiam membranacea, vel quasi mediæ cujusdam inter crustaceam coleopterorum et scariofam neuropterorum naturæ, quem ad modum in *blattis*, *gryllis*, *fulgoris*, *cicadis*, &c. reperimus. Non est mei instituti, hic de omnibus ulonatorum et rhynchotorum generibus, ne dicam formis singulatim exponere, aut varia discrimina, quæ circa eorundem alas, pro generis, speciei, varietatis et sexus diversitate, obtinent, curate persequi. Alioquin operæ pretium foret, utrumque systema Linnæanum et Fabricianum ad ipsius naturæ obrussam exigere; atque ex universo habitu demonstrare, an et quatenus illi duo naturales ulonatorum et rhynchotorum ordines, ad unum artificialem hemipterorum combinari mereantur. Sed ne longius a proposito nostro divagemur; ulteriorem hanc disceptationem omittentes, nunc exempli causa solummodo monebimus, ex neglectu modo laudatæ observationis, ortam esse falsam descriptionem *Blattæ Petiverianæ*. Fabricius (*Entomol. system. tom. 2. pag. 9. n. 16.*) hanc ita definit: "*Blatta nigra, elytris maculis quatuor flavescens*." Genus quidem suo jure emendavit, est enim utique insectum hoc *blatta*, sicuti jam Pallas recte docuerat; sed differentiam specificam perperam repetit a *Cassida Petiveriana* Linn. syst. nat. 2. pag. 578. n. 28. quum debuisset desumere a *cassida septemguttata* Linn. pag. 577. n. 19. quam merito huc eodem refert. Est enim profecto: *blatta nigra, coleoptris maculis septem albis*. Errat quidem ibi Linnæus, dum scribit: "*elytra singula maculis tribus albis, longitudinaliter*" "*digestis rotundis; et in medio unica utrisque elytris communi*." Potius ita res habet: elytrum sinistrum, præter tres maculas rotundas longitudinales albas aut si mavis flavescens habet insuper quartam in margine interiore sinistri elytri, qui alterius dextri marginem anteriorem ultra basin obtegit, quemadmodum in reliquis etiam *blattis* plerisque esse fierique solet.

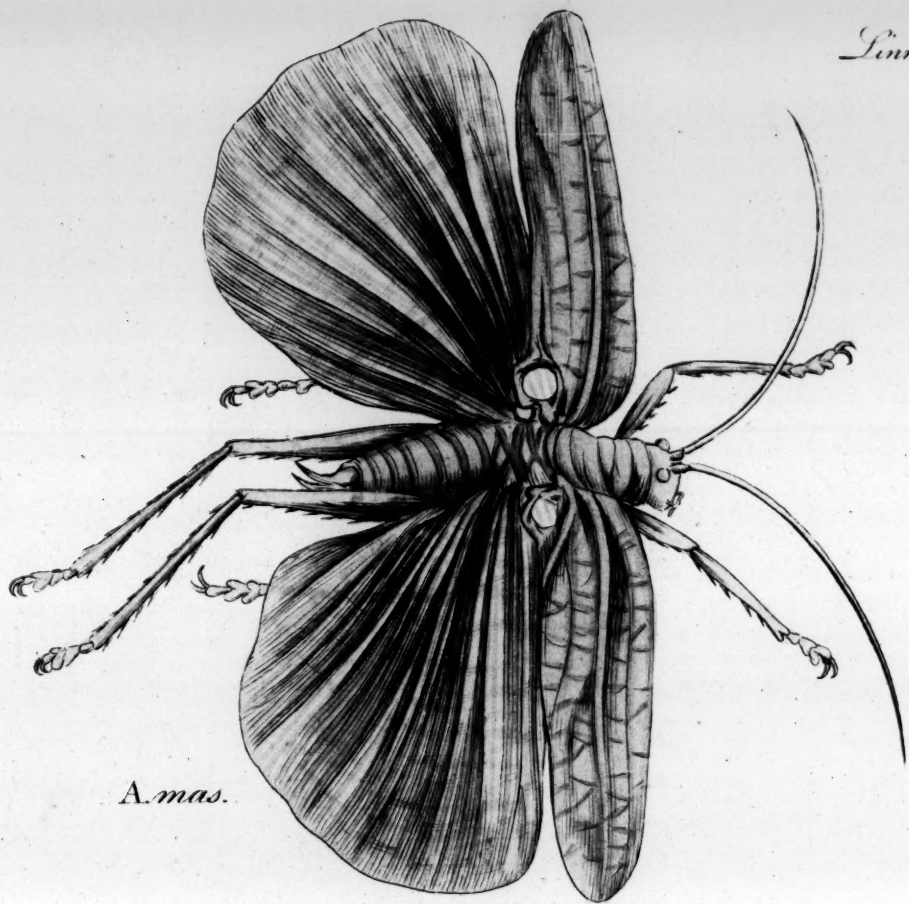
Jac. Petiverius *Gazophylac. tab. lxxi. fig. 1.* primam dedit hujus insecti figuram, in qua falso utrumque elytrum gaudet quatuor maculis.

culis. Præter maculam ad marginem interiorem elytri dextri, et alarum defectum, icon et descriptio bene cum natura conveniunt. Illustrissimus Pallas in *Spicil. Zool. fasc. 9. tab. 1. fig. 5.* dedit figuram apprime bonam, in qua, sicuti natura postulat, elytrum sinistrum est superius et quadriguttatum, dextrum vero inferius gaudet modo guttis tribus. Sulzer, *Hist. Insect. tab. 11. fig. A. B.* omnia invertit, ut in iconibus chalcographicis fieri solet, quando imagines temere ita æri inciduntur, quemadmodum in ipsa natura vel in adumbratione prototypa exstant. Hinc fit, ut elytrum dextrum loco sinistri superius et quadrimaculatum evadat. Herbst, *Archiv. Inf. tab. 49. fig. 7.* dedit figuram coloribus illustratam, exacte cum ipsa natura convenientem; in textu vero, *pag. 185.* solummodo de alarum inferiorum præsentia locutus, reliqua pristinarum figurarum vitia, circa numerum macularum in elytro dextro et sinistro, plane silentio prætermisit.

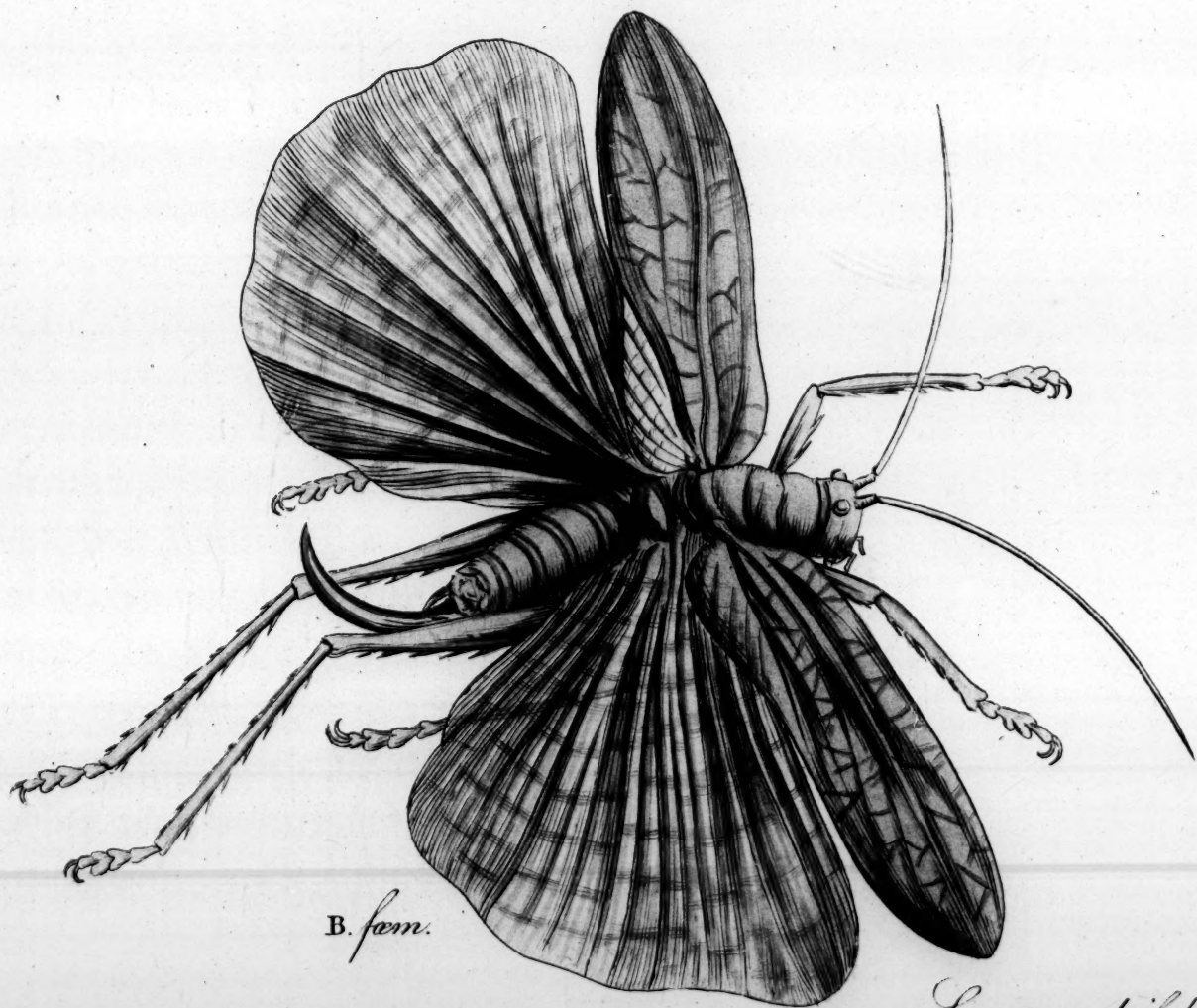
Verum relinquamus *Blattas*, de *Locustis* ex professo disputaturi. In hoc genere nempe non solum, ut in omnibus hemipteris, basis elytri sinistri obtegit marginem internum dextri, verum etiam in maribus, hic ob defectum ensis partumeii facillime agnoscendis, eadem isthæc basis elytri sinistri, ope alicujus scrobiculi rotundi, satis firmiter compaginatur cum scrobiculo simili, at paulo ampliore et profundiore, juxta marginem interiorem elytri dextri existente. Recipit enim inferius illud acetabulum dextrum parte sua concava alterius desuper ingruentis elytri convexam apophysin, ut inde oriatur quasi quædam temporaria synarthrosis, ferme in eundem modum sicuti clausuræ fibularum, vel potius instar contignationis, qua florum papilionaceorum alæ, carinæ eorundem, citra symphyfin, satis firmiter inhærescunt. Prouti vero capitulum illud, basi elytri scævi adnatum, amplum vel exiguum est, ita dextrum acetabulum huic recipiendo inserviens, plus minusve in conspectum venit. Neque hoc semper proportionem totius corporis, ut major *Locusta* etiam ma-

jorem gerat ocellum fibularem. At acetabulum dextrum in omnibus masculis cujusvis speciei sine discrimine clarius patescit, atque oculi fenestrati similitudinem manifestiorem præ se fert, quam capitulum fibulare sinistrum in eadem specie, imo in eodem exemplari. Utrumque illud instrumentum vix in visum cadit contemplanti *Locustam viridissimam* Fabric. n. 32. Contra vero liquido apparet in *Locusta varia* Fabric. n. 35. quamvis illa major, quamvis hæc minor existat. Negari quidem nullo modo potest, longe certissime elucescere has partes, in illis *Locustarum* formis, quarum mares Fabricius, sub nominibus *Locustæ perspicillatæ*, *specularis* et *perforatæ* descripsit. Nihilo tamen secius in omnibus quoque reliquis *Locustis* Fabricii, videlicet præter omnino apteras, vestigia ejusdem fabricæ, etiamsi haud ubique pariter manifesta, deprehendet cordatus et sagax arbiter, quotiescunque specimina sexus masculini curate ac subtiliter examinabit. Depingi curavi *Locustam*, elytris lanceolatis concavis viridibus, alis rubris, quam sub nomine *locustæ salvifoliæ* descripsi in Catalogo Musei Holthufiani, *sect. 3. pag. 82. n. 72.* Mas hujus novæ speciei (vid. *tab. 5. fig. A.*) gerit juxta basin elytrorum ocellum dorsalem fenestratum; foemina vero (*fig. B.*) ense partumeio insignis, habet marginem internum ibidem pariter incumbentem sinistrum dextro, at prorsus simplicem et planum. Utcunque magna intercedit inter hanc nostram *salvifoliam* et *Locustam perspicillatam* Fabric. n. 10. similitudo, non tamen pro eadem specie habere licet, quoniam laudatus auctor de rubro colore alarum plane tacet, quem neutiquam prætermisisset tam oculatus arbiter. Quando idem ocellum dorsalem fenestratum cum ense adscendente extrorsum crassiore conjungit, certissime aliquis error, qualiscunque demum est, latet, sola curata contemplatione exemplaris Hunteriani extricandus. Ex comparatione omnium *Locustarum* quas unquam oculis usurpavi, pro certo mihi constat, illos ocellos fenestratos esse perpetuum et constantem characterem sexus masculini, numquam cum ense, foeminis

Lin. Trans. IV. tab. 5. p. 58.



A. mas.



B. fem.

Locusta salviifolia.



in hoc genere proprio, co-existent. Cæterum ipsum illud splendorem colorum jubar extra omnem dubitationis aleam ponit, quod utrumque illud insectum *fig. A. et B.* depictum solummodo ratione genitalium et baseos elytrorum qua marginem interiorem differat, ideoque manifesto sit pro duplici sexu unius ejusdemque speciei reputandum. Fac igitur, id quod, donec probetur contrarium, pro vero certoque defendere valeo, cunctas *Locustas* mares gaudere acetabulis dorsalibus, plus minusve ocellaribus sive fenestratis; contra vero foeminas margine inferiore juxta basin elytrorum plano; atque hunc characterem sexualem in hoc genere naturali a Fabricio rite constituto, non minus esse constantem, quam præsentiam vel defectum ensis partumeii: cui bono hanc singularem structuram optimum maximum naturæ opificem machinatum esse dicemus? Utinam universa teleologia tam prona foret adeoque expedita: tunc illicet, me ultro auctorem systematis teleologici existurum esse, profiterer. Nihil profecto aliud egit aut agere potuit summus rerum naturæ arbiter Deus, quum masculæ forti daret alas superiores ita diversas ab elytris foemineis, nisi ut *Locustas* femellas, utpote ovorum sequestras, proliisque futuræ cara pignora, pro conservandis speciebus, ita tutissime ab ingruentium hostium injuria defenderet; mares contra, post impregnata fecundo coitu ova, nulli alteri amplius in œconomia naturæ, usui futuros, proscriberet, atque volucris et insectis zoophagis in prædam traderet. Quando nimirum avis vel alius qualiscunque hostis appropinquat *Locustarum* gregi; foeminæ extemplo expedita elytra explicare, in alas se conjicere, volatuque fugam capescere valet. At rursus mares, præsertim veneris usu debilitati, sinistrum elytrum (ut ipsum ex acetabulo dextro, cui per apophysin illam baseos qua marginem internum inhærescit, tollant) magno conatu lentoque successu levaturi, occupantur interim ab adversariis, qui, saginati mascula præda, fugaces matres studiose persequi negligunt, commodiore esca contenti. Quid? quod eadem hac

structura consultum voluit sapientissimi numinis providentia gravis, ne falaces mares invitas illas vana et præpostera libidine vexarent. Coitus *Locustarum* non potest aliter peragi, nisi elytris complicatis. Hinc mares ægre se allevantes, nullo modo violenter comprimere queunt altius fuccinctas multoque expeditiores fœminas. Nec tamen sese exhibuit iniquum contra mares *Locustas* creator sanctissimus idemque indulgentissimus. Nam cantum illis dedit, fatalium sibi et ipsis alioqui partium attritu prurientes fœminas virgines allecturis, ne cælibes repulsæ tædio fatigati animum desponderent, aut contra naturam inter semetipsos veneris diverticula quærerent. Quamvis ergo *Locustæ* mares, præ aliis aliorum generum insectis masculini sexus, pro salute fœminæ fortis devoti et pessusdati esse videntur: attamen blanda mercede redimuntur, magnoque gaudent privilegio, quod cum paucis modo, præsertim cum *Cicadis*, commune habent, scilicet ut fœminæ, arguti ac sonori stridoris dulcedine captæ, ultro petant amplexus, dum citra molestæ verecundiæ delicias ipsæ conscendunt miseros inopesque amasios, ab ambitiosæ persecutionis labore immunes. Idem alia quadam ratione in pulicibus fieri constat, etiamsi in tam parvis causa cur ita rem habeant investigatu difficilis lateat.

Neque vero in solis *Locustis* vel adeo hemipteris obtinere videtur talis alarum pro variante sexu diversitas, quam solers natura ob similem scopum videtur esse machinata. *Lepidoptera* Linnæi, five *Glossata* Fabricii, magna ex parte produnt istiusmodi providæ naturæ molimina. Multi *Papiliones*, præsertim *Heliconii*, peculiare gerunt elateres, alarum remigio, vel potius velificanti aërio cursui, pro sexus varietate diversimode inservientes. *Sphinges* mares reperiuntur præditi fibulis pro ala superiore cum inferiore constringenda relaxandave, quibus carent fœminæ, alio mechanismo pandentes et rursus contrahentes Dædalea vela. Qua de re exstat singularis lectu dignissima commentatio in Transactionum Societatis Linnæanæ Londinensis vo-

lumine primo, cujus uberior discussio non est mei præsentis instituti. Cæterum ipsa insecta *aptera* Linnæi, ac præsertim *agonata* Fabricii, magna ex parte illam habent indolem, ut mares, ad analogiam quasi quamdam multarum plantarum dioicarum, citius ad maturitatis ac robusti vigoris florem pertingant, et rursus, peractis nuptiis, multo celerius e rerum natura quotannis evanescant, quam fœminæ, quas pro sobole ad maturitatem perferenda diutius superstites manere fas est. Sic, verbi causa, *Gammarus stagnalis* (Fabric. *Entomol. System. tom. II. p. 518. n. 11.*) cujus descriptionem novissimam atque curatissimam debemus viro experientissimo doctissimoque Georgio Shaw Med. Doct. (*Transact. of the Linn. Soc. vol. I.*) insectum in fossis quibusdam prope Hamburgum satis frequens, quotannis, apparet circa initium veris, et quidem eo ordine, ut primum statim post glaciei nivisque regelationem parva nec dum adulta soboles utriusque sexus reperiatur, inter quam masculi celerius ad justam perfectamque magnitudinem excrecere solent. Hi quidem cum femellis paulo post ipsos adultis co-exsistunt et nuptias celebrant, quibus peractis mox evanescunt mares, relictis solis viduis pregnantibus, quæ brevi tempore ante fervorem æstatis fossas exsiccantem moriuntur, postquam ova in limo deposuerunt. Limus ille per æstatem durefcit atque in pulverem abit, auctumno demum imbribus madescit, nec tamen in nostro climate umquam excluduntur ova ante hiemem. In agro Brunsvicensi per auctumnum quoque hunc *Gammarum stagnalem* me in perfectæ ætatis robore vigentem videre memini, sed nunquam circa Hamburgum. Obiter hæc monuisse sufficiat. Univerfa quidem per omnia omnium classium genera disquisitio, quænam animalia et præsertim insecta fœmineæ fortis, ope singularis providentiæ, præ masculis diutius ab interitu defendi et conservari soleant, forsan neque jucunditate careret, neque usu œconomico. Sed profiteor, me nondum sufficientes observationes circa generalem illam fœminei sexus prærogativam instituisse, vel institutas satis rite digessisse.

digeffisse. Hoc saltem jam nunc pro certo affirmare aufim, multo latius patere hanc rationem, quam ut de insectorum quibusdam generibus solummodo valeat. Pisces certe multi, præcipue *branchiolegi* et *chondropterygii*, per certas anni tempestates nulli nisi foeminei sexus capiuntur. Sed, ut unde sum digressus denique redeam, *Locustas* Fabricii, præsertim exoticas, foeminas multo plures quam sexus masculini in omnibus vel maximis museis deprehendi, constans et perpetua experientia docet. Neque hoc mirum videbitur amplius cordato entomologo, consideranti quanto diutius insectorum plurimorum foeminae superstites manere soleant, quam mares ejusdem speciei. Idem in primis manifestum est in genere *Mantis*, cujus curatissimam elaboravi monographiam, quam entomologorum facile princeps Fabricius vehementer approbavit, et quam elegantibus figuris illustratam publici juris facere haud gravabor.

VI. *A New Arrangement of the Genus Polytrichum, with some Emendations.* By Mr. Archibald Menzies, F. L. S.

Read February 7, and March 7, 1797.

IT is not my intention to present you with a long and tedious history of the genus *Polytrichum*; my objects are merely to establish, by your sanction, what I conceive to be its true and obvious characteristics, and to discriminate the different species, by laying before you, with due diffidence, the following arrangement, in which you will readily perceive that I have added several new ones, and separated some of the most conspicuous varieties of authors into distinct species. This led me on to form new descriptions, and to new-model the whole genus.

At the time this genus was first described, there were but few species of it known; consequently its character could not be made so general, nor its arrangement so complete, as when a much greater number of species are at once before us. Indeed it is pretty evident that Linnæus took its character chiefly from the *Polytrichum commune*, and what were considered as its varieties, as we find so much stress laid upon the *apophysis* at the base of the capsule, that, for want of that single distinction, three species were then excluded, and forced with discordant characteristics into another genus, under the name of *Mnium Polytrichoides*, and varieties: and although some of these have been since restored to their proper place, on account of their natural affinity, yet we find but few satisfactory attempts

tempts made to amend the general character of the genus; though it is very clear that the character taken from the *apophysis* ought to have been long ago excluded, or rather ought never to have been admitted, as it was only to be found in a few species, and therefore could not with propriety be considered as a generic distinction.

The laborious works of the celebrated and persevering Hedwig have, of late years, thrown much light upon the subjects of this natural order; but the general complaints against his new arrangement of it are, that his genera are too artificial, and that their characters are taken from parts so minute and difficult to examine, that they rather tend to perplex and discourage a young beginner in his investigations, than aid his pursuits in acquiring a scientific knowledge of this intricate tribe. While it can therefore be avoided, no generic or specific characters ought ever to be adopted, that cannot easily and distinctly be seen by the assistance of a single lens magnifier, such as Botanists commonly carry in their pockets.

Hedwig's generic characters have indeed this recommendation, that they are short and extremely beautiful upon paper, on which account his character of this genus has been lately adopted by authors whose erudition and general accuracy none can admire with more profound respect than I do; yet I cannot join them in this instance without offering violence to a beautiful and natural family, merely because its individuals differ only in the number of small dents in the *peristomia*, or rim of the capsule; some having thirty-two dents, others about double that number.

For these reasons I have not ventured to place much dependence on Hedwig's new character of this genus, more especially as it brings together plants which have so little natural affinity: of this we have an example, in his making the *Bryum undulatum* a *Polytrichum*, though it agrees in no other respects with this genus than
merely

merely in the number of minute dents, and general structure at the orifice of the capsule.

This author's strict adherence to these very minute characters has made him regardless of others more conspicuous, and induced him to place another plant under this genus, viz. the *Polytrichum hircinicum*, which, from its single calyptra with upright hairs, more obviously, and perhaps more naturally, belongs to one of his new genera. I shall therefore in the following arrangement be obliged to exclude these two species of Hedwig: nay, I must go further; many authors, and those too of great respectability, have placed the *Bryum striatum* of the *Species Plantarum*, and its varieties, under this genus, although they have not the most distant affinity, and, according to the generic character I have adopted, cannot possibly be arranged under it. Hedwig has, I think, very properly described these varieties as distinct species, and placed them under a new genus, which he calls *Orthotrichum*; and though I am not at present much inclined to adopt his minute distinctions, or follow him in his revolutionary career through this natural order, yet I cannot help considering this genus as a real improvement, and shall endeavour at a future opportunity to lay some account of it before the Linnean Society, as my late peregrinations have enabled me to enrich it with a considerable number of new species.

Having thus excluded these several species, and seemingly mutilated the genus, it now remains for me to establish its characteristic; and this I am happily enabled to accomplish by means of that ingenious discovery of the double calyptra, made upwards of twenty years ago, and nearly about the same time, by two celebrated Naturalists, who were then unacquainted with each other's labours, and consequently may both be considered as equally entitled to the merits of this improvement. It was first published in the year 1775, in Leers's *Flora Herbornensis*, where, after describing the *Poly-*
VOL. IV. K *trichum*

trichum commune, page 229, the author makes the following observation :

“*Polytrichum hoc calyptrâ gaudet duplici: exteriore pilosâ, interiore multo minore, membranaceâ, albidâ, lævi; exteriore obtectâ.*”

I do not find that Leers made any practical application of this discovery, or traced it in any other species: but Mr. Curtis, a valuable member of this Society, who made the same discovery the year following, pursued it further, and finding the double calyptra constant in other species as well as the *Polytrichum commune*, he applied it, with his usual perspicuity and discernment, as a distinguishing character of the genus, in one of the numbers of his *Flora Londinensis*, published in the year 1778; and I am confident that a more beautiful or a more obvious one could not be selected, having found it constant and invariable in every species here described, except the *Polytrichum magellanicum*, which has only a single smooth calyptra; but then it so strongly possesses the peculiar habits, and every other characteristic of the genus, that I think it cannot possibly be separated. I have therefore drawn up the following general character, which, with the above exception, will be found applicable to every individual of this natural family.

P O L Y T R I C H U M.

Natural Character.

THE plants of this genus, whether single or branched, grow mostly erect from the ground, and have an unpliant stiffness or rigidity of appearance that peculiarly distinguishes them from most others of this natural order.

The *leaves* are generally thick, tough, and rigid, growing round the stems and branches without order, and pressing close or half-embracing them by broad, sheathy, membranaceous bases.

The *peduncles* are smooth, stiff, shining, erect, and for the most part arise from the summits of the stalks and branches, out of a cylindrical membranaceous tube or *perichæcium*, that closely surround the base of each.

The *capsules* are of various forms, as roundish, quadrangular, and oblong; and each has a pointed lid or *operculum*, with a thin transverse central membrane underneath; and when these are removed or fallen off, the rim of the orifice appears elegantly fringed with a regular row of incurved minute dents (either thirty-two dents, or about double that number), which before maturity are connected by their tips to the central membrane.

The *calyptra* is double, one within the other; the exterior one is composed of shining woolly hairs, closely matted together, and is generally of a conical figure, lacerated in a loose manner at the base, but compact at the top, where it is closely united to the inner one, and is, for the most part, about double its length: the interior one is small, subulate, smooth, tough, and membranaceous; but, as the capsule swells, it bursts open on one side from the base upwards for half its length or more.

Character essentialis.

Caps. operculata, subrotunda, oblonga seu quadrangula.

Perist. dentatum: dentibus incurvis (32—64) apicibus membranâ transversâ adglutinatis.

Calyp. duplex: interior lævis, membranacea, minuta: exterior floccosa, apicibus unitis.

Mas disciformis, in distincta planta.

SPECIES.

* *Acaulia*.

1. *POLYTRICHUM tenue*, fol. lanceolatis acumminatis adpressis integerrimis, capsula cylindrica erecta.

MNIUM polytrichoides var. γ . Linn. Sp. Pl. 1577. Dill. Musc. 434. t. 55. f. 12.

Hab. in Nova Scotia, locis sterilibus prope Halifax.

The *leaves* of this are but few in number, and press close round the base of the peduncle; the inner ones are longer and more acutely pointed than those on the outside; they are thin, lanceolate, sharp-pointed, and entire on the edges, with a strong middle nerve; and in a dried state they are of a reddish brown colour.—The *peduncle* is nearly an inch long, of a deep straw-colour, and closely furrounded at the base by a tubular *perichætium*.—The *capsule* is cylindrical and erect; the *operculum* reddish, almost flat, and slightly pointed in the centre.—The exterior *calyptra* is of a light straw-colour, and somewhat more than double the length of the inner one, which is smooth and of the same colour, but somewhat paler.

2. *POLYTRICHUM subrotundum*, fol. lanceolatis obtusis integerrimis rigidis, capsula turbinata erectiuscula.

MNIUM polytrichoides Linn. Sp. Pl. 1576. Dill. Musc. 428. t. 55. f. 6. A. B. C. D. E. F.

P. subrotundum Hudf. Fl. Angl. ed. 1. 400. Scop. Fl. Carn. 134.

n. 2. Vaill. Par. 131. tab. 26. f. 15.

P. pumilum Swartz. in Act. Stockholm. 1795. p. 271.

Hab. in ericetis, et locis sterilibus Angliæ, &c.

This

This has no *stalk*.—The *leaves* are lanceolate, obtuse, thick, short, and rigid, without any apparent middle nerve, and entire on the edges: they are crowded round the base of the peduncle; of a dark green colour when recent, but blackish when dried.—The *peduncle* is from a quarter to about three quarters of an inch long, of a dark reddish colour, and surrounded at the base by a vaginal *perichæium*.—The *capsule* is short, turbinate and somewhat erect: the *operculum* is flat, but pointed in the centre, and the rim is conspicuously fringed with minute dents.—The exterior *calyptra* is conical, of a dark ferruginous colour, and about twice the length of the inner one.

Dr. Swartz having lately sent me a specimen of his *P. pumilum*, I carefully compared it with the above, and found it to be the same species.

3. *POLYTRICHUM nanum*, fol. lanceolatis obtusiusculis, apice obscure ferrulatis, capsula hemisphærica cernua.

MNIUM polytrichoides Linn. *Sp. Pl.* 1576. *Dill. Musc. tab.* 55. *f.* 6.

G. H. I. K. L.?

P. nanum Hedw. *Stirp. Crypt. vol.* 1. 35. *tab.* 13.

Hab. in ericetis, et locis aridis Angliæ, &c.

This species has scarcely any *stalk*.—The *leaves* are lanceolate, somewhat obtuse, and entire on the edges towards their base, but slightly ferrulated towards their tips: they are not so thick and stiff as in the preceding species, but are somewhat longer.—The *peduncle* is from half an inch to upwards of an inch long, of a deep orange colour, and arises out of a vaginal *perichæium* about one tenth of an inch long.—The *capsule* is short, hemispherical, a little inclined or somewhat nodding, and the rim is beautifully fringed with

with minute dents: the *operculum* is flat, but in the centre very slightly pointed.—The exterior *calyptra* is short and conical, ending in a small *mucro*; it is of a light ferruginous colour, and double the length of the inner one.

This and the preceding species have been confounded together by most authors, although they appear very distinct; and I am doubtful whether Dillenius himself has not fallen into this mistake, as he seems to have given both under the same figure: but having delineated them on two separate papers in his original drawings, which are in Sir Joseph Banks's library, there is reason to suppose that he originally intended them to be distinct species.

** *Caule simplici.*

4. *POLYTRICHUM aloides*, fol. lanceolatis conniventibus obtusiusculis rigidis apice ferratis, capsula cylindrica obliquata.

MNIUM polytrichoides var. β . Linn. *Sp. Pl.* 1577. Dill. *Musc.* 429.

t. 55. f. 7. Vaill. *Par.* 131. t. 29. f. 11. Weiss *Crypt.* 173.

P. nanum Lightf. *Fl. Scot.* 701. Hudf. *Fl. Angl. ed.* 2. 470.

P. aloides Hedw. *Stirp. Crypt.* vol. 1. 37. tab. 14.

Hab. in ericetis, et locis sterilibus Angliæ, &c.

The *stalk* of this is about a quarter of an inch high.—The *leaves* are of a dark green colour, and press close together round the stalk, especially in a dried state: they are thick, lanceolate, somewhat obtuse, and finely ferrated towards their tips.—The *peduncle* is from half an inch to an inch long, of a deep straw-colour tinged with red, and issuing from the top of the stalk out of a tubular *perichaetium* about a tenth of an inch long.—The *capsule* is cylindrical and a little

little oblique, with a flat *operculum* pointed in the centre.—The exterior *calyptra* is of a light ferruginous colour, especially towards the tip, and is double the length of the inner one.

5. *POLYTRICHUM convolutum*, fol. linearibus involutis apice ferratis; ficcitate contortis, capsula cylindrica erectiuscula.

P. convolutum Linn. fil. *Method. Musc.* 33. t. 1. f. 3. Swartz *Prod.* 139.

Hab. in India occidentali, &c.

The *stalk* is erect, and varies from an inch to about three inches in height.—The *leaves* are longer and more crowded towards the top of the stalk: they are slender, linear, with their edges finely ferrated towards their tips; and in a dried state they are of a dark brown colour, with their edges turned in, so as to appear channelled.—The *peduncle* is from an inch to an inch and half long, issuing from the summit of the stalk out of a loose tubular *perichæcium* about a quarter of an inch long.—The *capsule* is somewhat erect, short and cylindrical, with a strong rim finely dentated.—The exterior *calyptra* is of a light ferruginous colour, and about two-thirds longer than the inner one.—The male roseaceous cups are produced upon the summits of separate stalks, and are sometimes proliferous.

6. *POLYTRICHUM magellanicum*, fol. lineari-lanceolatis acutis denticulato-ferratis, capsula oblonga sub-cylindrica erectiuscula, calyptra simplici. TAB. 6. FIG. 1.

P. magellanicum Linn. *Suppl. Plant.* 449.

Hab. in freto magellanico, et in Nova Zeelandia.

This grows stiff, erect, and from two to even six inches high: the lower part of the *stalk* is naked, but the upper part is surrounded

rounded with spreading leaves, which are longer and more copious at the termination of each year's growth and round the base of the peduncles.—The *leaves* are long, spreading, linear-lanceolate, and ferrated with deep dents on their edges: in a dried state they are of a reddish-brown colour, and their edges turn in, so as to give them a round or subulate appearance.—The *peduncles* are shining, of a light straw-colour, and from two to three inches long, issuing out of a tubular *perichætium* from the summit of the stalk; but as a young shoot frequently issues from near their base, the peduncle thereby becomes lateral, and thus there are often two on the same stalk, one terminal and the other lateral.—The *capsule* is oblong, nearly cylindrical, and somewhat erect: the *operculum* is conical, with a long slender point turning sideways.—The exterior woolly *calyptra* is wanting: the inner one, which is smooth, subulate, and of a dark brown colour, is about three tenths of an inch long, with a little roughness appearing about the point: as the capsule swells it splits sideways from the bottom upwards.—The male rosaceous cups are proliferous, and upon separate stalks, which in general produce stronger and more crowded leaves.

I was enabled to ascertain this plant by carefully comparing it with the original specimen of *P. magellanicum* in the Linnean Herbarium.

7. *POLYTRICHUM attenuatum*, fol. lineari-lanceolatis carinatis cartilagineo-ferratis patulis, capsula quadrangulari cernua, basi constricta. TAB. 6. FIG. 2.

Hab. in ora occidentali Americæ Septentrionalis.

The *stalk* of this species is simple, erect, and from an inch and half to upwards of three inches high.—The *leaves* are spreading, linear-lanceolate, with rough hispid points, and whitish cartilaginous edges deeply ferrated; the middle nerve is strong, whitish, and on
the

the back slightly dentated towards the tip. When recent the leaves are of a dark glaucous colour, but in a dried state they become rigid, and of a dark brown colour, with their edges curled in so as to make them appear round and channelled.—The *peduncle* is from two to four inches long, of a reddish straw-colour at the bottom, but much lighter towards the top: it arises from the top of the stalk, out of a close cylindrical sheath about one-eighth of an inch long.—The *capsule* is quadrangular, nodding, and a little contracted at the base, but not so much as to form an *apophysis*: the *operculum* is conical: the rim has about sixty-four minute dents.—The exterior *calyptra* is straw-coloured, of a pointed conical figure, and about a third longer than the inner one, which is smooth and of the same colour.

8. *POLYTRICHUM gracile*, fol. lanceolatis acutis carinatis denticulato-ferratis erectiusculis, capsula obovata subangulata obliquata, apophysi destituta. TAB. 6. FIG. 3.

Hab. in alpinis Scotiis, Dickson.—*et in Suecia*, Swartz.

This is simple-stalked, and of a slender appearance, from an inch to upwards of two inches in height.—The *leaves* are small, and remotely placed on the lower part of the stalk; but are larger, erect, and more crowded towards the top: they are of a light green colour, short, lanceolate, with acute hispid points, and ferrated with deep dents on their edges: the middle nerve is strong, whitish and dentated on the back, especially toward the tip.—The *peduncle* is about three inches long, shining, and of a deep orange colour, and arises from the summit of the stalk out of a cylindrical sheath about two tenths of an inch in length.—The *capsule* is nearly ovate, and obscurely angulated, without any apparent *apophysis*; the *operculum* is small and conical, ending in a straw-coloured point.—The exterior

calyptra is of a deep ferruginous colour, and about a third part longer than the inner one.

I was favoured with this species by Mr. Dickson, who collected it on Ben Nevis in Scotland, about half way up the mountain. I also received the same from Dr. Swartz of Stockholm, who lately discovered it in Sweden. His specimen has the lower leaves and calyptra black, which I consider only as accidental distinctions. I was at first inclined to consider it as a variety of *P. attenuatum*; but its slender appearance, its leaves being shorter, erect, and thinner set, and the difference in the form of its capsule, induced me to make it a distinct species; and I have some doubts whether it may not be the same which Dillenius has figured in *Tab. 54. fig. 2.* I have not however ventured to quote that figure till I am enabled to remove my doubts by a sight of Dillenius's specimen. Both this and the foregoing are to be distinguished from *P. commune* by their carinated leaves, with strong whitish middle nerves, by having no membranaceous leaves round the base of their peduncles, and no apparent apophysis at the base of their capsules.

9. *POLYTRICHUM commune*, fol. lineari-lanceolatis acutis ferrulatis, capsula quadrangulari, apophysi subjecta.

P. commune Linn. *Sp. Pl.* 1573. *Dill. Musc.* 424. *t. 54. f. 1.*

P. ferratum Schrank *Fl. Bav.* 2. 446. *n. 1371.*

Hab. in sylvis, et ericetis humidis.

The *stalk* is erect, from two to five inches and upwards in height.—The *leaves* are stiff, linear-lanceolate, ending in acute hispid points, and finely ferrulated on their edges: they are of a bright green colour when fresh, but of a reddish brown when dried or in decay: those on the top of the stalk, surrounding the base of the peduncle, differ from the others in being more erect, whitish, membranaceous, and

and entire on their edges, with greenish middle nerves, ending in long filaceous tips.—The *peduncle* is from two to four inches long, of a shining deep orange colour, and issuing from the top of the stalk out of a tubular sheath about a quarter of an inch in length.—The *capsule* is quadrangular, with an *apophysis* at the base, and is of a greenish colour when young, but reddish when ripe: the *operculum* is flat or rather concave, with a small point projecting from the centre.—The exterior *calyptra* is ferruginous, and about double the length of the inner one.

10. *POLYTRICHUM piliferum*, fol. lanceolatis confertis integerrimis rigidis apice piliferis, capsula quadrangulari, apophysi subiecta.

P. commune var. γ . Linn. *Sp. Pl.* 1573. Dill. *Musc.* 426. t. 54. f. 3.

P. piliferum Seeb. *Spicil.* 74. n. 1031.

Habitat in ericetis, et pascuis montosis Angliæ, &c.

This grows single, from half an inch to an inch and half in height, and is naked at the bottom, but at the top it is furnished with a crowded cluster of leaves.—The *leaves* are short, lanceolate, thick, stiff, and crowded, entire on the edges, and each tipped with a white hair.—The *peduncle* is stiff, reddish, and from half an inch to upwards of an inch in length, arising from the top of the stalk out of a tubular *perichætium*.—The *capsule* is small, nodding, and quadrangular, with a distinct *apophysis* at its base: the *operculum*, like the preceding, is concave, with a small mucro issuing from the centre.—The exterior *calyptra* is sometimes reddish, but generally of a dark ferruginous colour, and about as long again as the inner one.

II. *POLYTRICHUM juniperinum*, fol. lineari-lanceolatis mucronatis patulis, marginibus inflexis integerrimis, capsula quadrangulari, apophysi subiecta. TAB. 6. FIG. 4.

P. juniperinum Willd. *Fl. Berol.* 305 (excluso Synon. Dillen.)

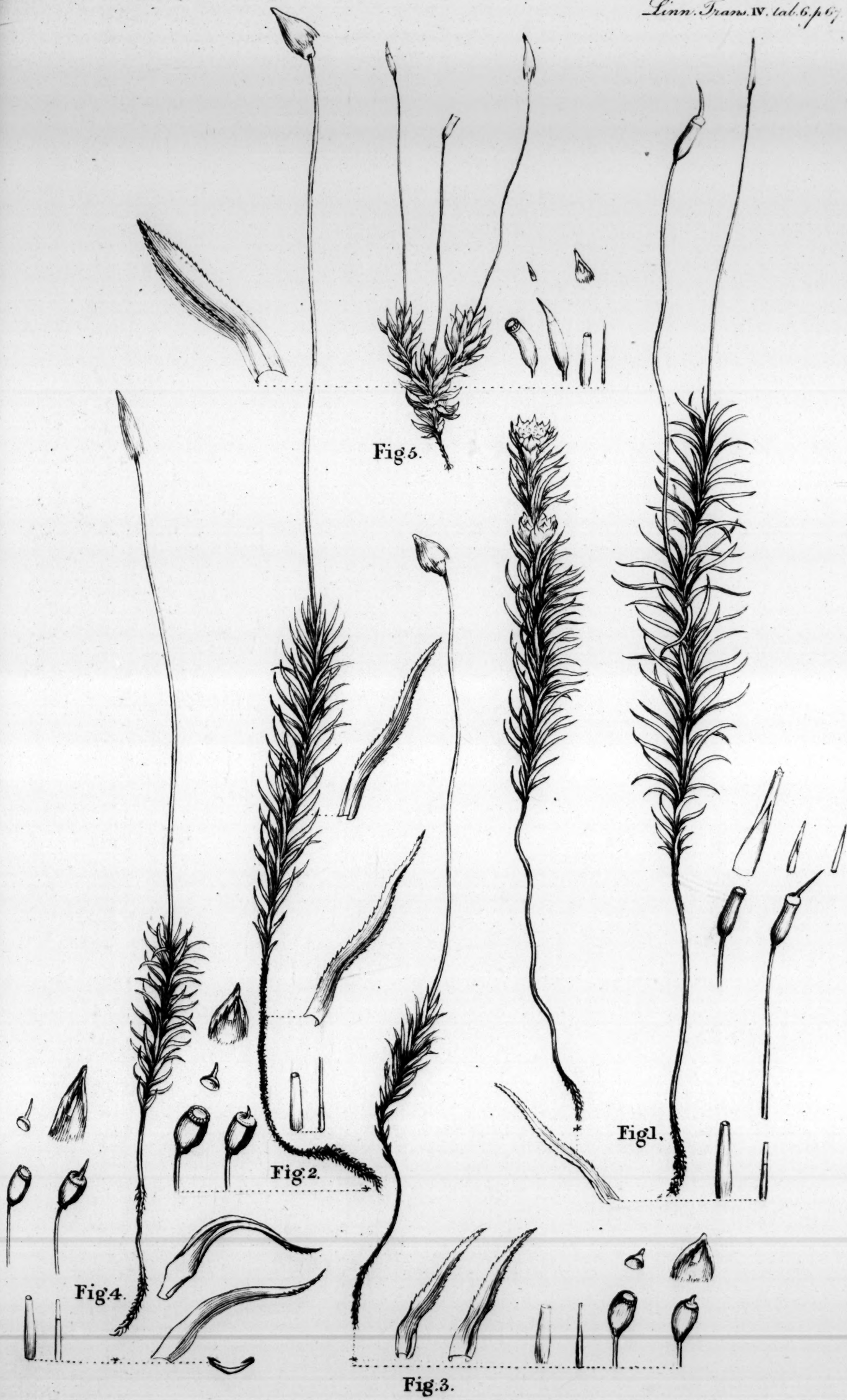
Hab. in ora occidentali Americae Septentrionalis.

The *stalk* is erect, from two to three inches high, and rather naked at the bottom.—The *leaves* are spreading, linear-lanceolate, and ending with sharp points, slightly hispid: their edges are entire, and fold in flat upon the surface of the leaf from both sides.—The *peduncle* varies from an inch and half to about three inches in length, and is closely furrounded at the base by a cylindrical tube or *perichatium*, which is about a quarter of an inch long, issuing from the top of the stalk.—The *capsule* is quadrangular, with an *apophysis* at the base; the *operculum* is flat but pointed in the centre, and the rim is fringed with a regular row of about sixty-four whitish dents.—The exterior *calyptra* is long and subulate, whitish at the bottom, but ferruginous at the tip, and about double the length of the inner one.

All authors I know of, who have taken up *P. juniperinum*, describe it with entire leaves, yet make no scruple in quoting for it *Dill. Musc.* 424. t. 54. f. 2. which that accurate author describes and figures with ferrated leaves: it is therefore very evident the quotation must be erroneous.

Note. The *Polytrichum pulverulentum* in *Gmel. Syst. Nat.* belongs, I believe, to this section; but as I have not been able to procure a sight of the plant itself, or even of the figure of it, quoted from *Reynar. Act. Lausann.* I could not take it up in this Arrangement.

*** *Caule*





*** *Caule ramoso.*

12. *POLYTRICHUM strictum*, fol. lanceolatis acuminatis erectiusculis, marginibus inflexis integerrimis, capsulis quadrangularibus, apophysi infidentibus. TAB. 7. FIG. 1.

Vaill. Par. 131. t. 23. f. 6.

Hab. in America Septentrionali, in locis sterilibus Angliæ, et in Scotia.

This species was gathered in the year 1766 on Newfoundland by Sir Joseph Banks, Bart. who described it under the foregoing name in a manuscript preserved in his library, which I was suffered to peruse in the most liberal manner. I found it about twelve years ago near Halifax in Nova Scotia, and since that time in several places on the north-west coast of America; and I lately found it also in different places in Scotland; particularly on the top of the park walls, on both sides of the road, about a mile to the eastward of Taymouth in Breadalbane, where it grows in common with *P. commune* and *P. piliferum*.

It is branched, and about two inches in height. The roots, together with the lower parts of the stem and branches, are covered with a whitish downy substance, of a spongy texture: the lower parts of the branches appear slender, from the leaves being smaller and more thinly set there than towards the tops, where the leaves are larger and more crowded.—The *leaves* are thick, stiff, erect, lanceolate and sharp-pointed, with entire edges, which, like the preceding, are folded flat back to the surface of the leaf from both sides: in a dried state the leaves press close to the stalk, and their points are slightly hispid: those which surround the base of the peduncles are mostly membranaceous and pellucid, with greenish middle nerves ending in slender filaceous tips.—The *peduncles* are from an inch to two inches in length, arising from the summits of the branches out of cylindrical tubes
nearly

nearly a quarter of an inch long, which closely surround their base. —The *capsule* is small and quadrangular, with an *apophysis* at the base: the *operculum* is reddish and flat, with a small point issuing from its centre; and the rim of the orifice is fringed with about sixty-four minute dents. —The exterior *calyptra* is conical, of a light ferruginous colour, and about double the length of the inner one.

As this species generally divides very low down, single branches of it may be carelessly pulled up or separated, in which state it may sometimes be confounded with the *P. juniperinum*; but its being rather smaller in all its parts, its leaves being shorter, stiffer, more erect and crowded towards the top of the branches, and its lower parts being generally matted together and enveloped in a whitish downy substance, will easily distinguish it.

As neither the woolly calyptra nor the downy substance about the lower parts of the plant are expressed in Vaillant's plate, I have been induced to give a new figure of it, from a specimen collected in Nova Scotia.

13. *POLYTRICHUM contortum*, fol. linearilanceolatis ferratis involutis siccatate contortis, pedunculis lateralibus, capsulis cylindricis erectiusculis. TAB. 7. FIG. 2.

Hab. in ora occidentali America Septentrionalis.

This is from two to four inches high, and generally naked towards the bottom, but covered with leaves, and often divided into two or three branches towards the top. —The *leaves* are linear-lanceolate, with their edges turned in and finely ferrated, without any apparent middle nerve: when fresh they are of a dark green colour; but in a dried state they are contorted, and of a dull dark brown colour: they are rather thinly scattered on the stalk, excepting here and there where they form tufts by being more thickly set and somewhat

what longer at the termination of each year's growth.—The *peduncles* are from an inch to an inch and half long, and arise out of a vaginal tube about a quarter of an inch in length, at the extremity of each year's growth; but as the young shoots issue from their base, they afterward become lateral.—The *capsule* is cylindrical and somewhat erect, having a strong annulated rim fringed with about thirty-two minute dents: the *operculum* is conical and pointed.—The exterior *calyptra* is small, of an oval form, and of a light straw colour, and is about twice the length of the inner one.

This species very much resembles *P. convolutum*, but that has always a simple stalk with a single terminating peduncle, and its leaves are only slightly ferrated towards their tips; whereas this, even in its simple state, has generally two or three lateral peduncles, and the leaves are finely ferrated their whole length, which will afford sufficient marks of distinction.

14. *POLYTRICHUM rubellum*, fol. lanceolatis carinatis obtusiusculis ferratis dorso denticulatis, capsulis subcylindricis erectiusculis.

TAB. 7. FIG. 3.

Hab. in ericetis Scotiæ, et locis sterilibus Angliæ.

The *stalk* of this species appears reddish, and is generally slightly branched, though not unfrequently met with single, and grows from an inch to two inches in height.—The *leaves* are obtusely lanceolate, and finely ferrated on the edges, with the middle nerve dentated on the back of each: those on the upper parts of the stalk and branches are of a dark glaucous colour, changing in the dried state to a dull blackish hue; but the lower leaves, and the bases of the upper ones, are reddish, and become whitish when dried; they are generally larger and more crowded at the top and at the divisions of the branches.—The *peduncles* very seldom exceed three in number, and
are

are from an inch to an inch and half in length: they are reddish, slightly twisted, and generally terminate the lower branches, each arising out of a cylindrical tube, about two tenths of an inch long.—The capsule is somewhat erect, and nearly cylindrical, having a strong annulated rim, fringed with a regular row of reddish dents: the operculum is long and subulate.—The exterior woolly calyptra is ferruginous, and about double the length of the inner one.

The only plant which this resembles is *P. aloides*, and I strongly suspect that they have been hitherto confounded together, both by Hudson and Lightfoot, under the name of *P. nanum*. It is undoubtedly a very distinct species from *P. aloides* of Hedwig, not only by its being larger in all its parts, and generally branched, but also by its leaves being ferrated their whole length, and dentated on their back along the course of the middle nerve.

15. *POLYTRICHUM dentatum*, fol. lanceolatis acutis aculeato-dentatis, capsulis subcylindricis erectis. TAB. 7. FIG. 4.

Hab. in ora occidentali Americæ Septentrionalis.

It is from an inch to two inches high, and generally divided into three or four slender branches.—The leaves are stiff, lanceolate, acute, and strongly dentated on the edges with sharp whitish dents; their colour is a dark green when recent, but a reddish brown when dried; the middle nerve is elevated on the back of the leaf, and marked with a few dents near the tip.—The peduncles are generally two or three in number, of a dark reddish colour, and grow to an inch or an inch and half long: they arise from the summits of the branches out of cylindrical tubes which surround about two tenths of an inch of the base of each.—The capsule is somewhat cylindrical and erect; the rim is strong and fringed with minute dents: the operculum is flat, with a small point in the centre.—The exterior calyptra

calyptra is of a ferruginous colour, and about twice the length of the inner one.

This is in Sir Joseph Banks's Herbarium, and was first brought from the north-west coast of America by Mr. Nelson, who accompanied Captain Cook in his last voyage. I have since frequently met with it myself in the pine-forests on the same coast; but it has not been found, to my knowledge, any where else.

16. *POLYTRICHUM urnigerum*, fol. lanceolatis acuminatis denticulato-ferratis rigidis, capsulis cylindricis erectis.

P. urnigerum Linn. *Sp. Pl.* 1573. *Dill. Musc.* 427. t. 55. f. 5.

Habitat in ericetis montosis Angliæ, &c.

This grows from an inch to three inches in height; the lower part of the *stalk* is naked, but the upper part is crowded with leaves, and generally divided into numerous branches.—The *leaves* are lanceolate, sharp-pointed, rigid, and irregularly ferrated with acute dents.—The *peduncles* are about an inch or an inch and half long, and arise pretty copiously from the summits of the lower branches, and not from the *axillæ* of the leaves, as they have been generally described: the vaginal *perichæetium*, which closely surrounds the base of each, is about an eighth of an inch in length.—The *capsule* is cylindrical and erect, having the rim wide, and fringed with minute dents. The *operculum* is flat, with a small point in the centre, and covers the rim with a thick obtuse edge.—The exterior *calyptra* is small and subulate, of a light ferruginous colour at the top, but whitish towards the bottom, and is rather more than twice the length of the inner one.

17. *POLYTRICHUM septentrionale*, fol. lanceolatis acutis apice obscure ferrulatis, capsulis ovatis erectiusculis, operculo mucronato recurvato. TAB. 7. FIG. 5.

P. ramosum Gunner. *Fl. Norveg.* 814. *Fl. Dan. tab.* 297.

P. septentrionale Swartz in *Act. Stockh.* 1795. p. 270.

Hab. in alpinis Norvegicis.

This plant is about an inch and half in height, and from a small naked stem suddenly divides into short stiff crowded branches.—The leaves are short, narrow, lanceolate, acute, and entire on the edges, except towards their tips, where, with the assistance of a magnifier, they may be perceived slightly ferrulated: they are all nearly of the same size, and equally dispersed round the branches.—The peduncles are stiff, yellowish, about half an inch long, arising from the summits of the branches out of small sheathy tubes, which closely embrace their bases.—The capsule is ovate and nearly erect: the operculum is conical, ending in a long recurved mucro.—The exterior calyptra is of a light ferruginous colour, and about twice the length of the inner one.

This is to be distinguished from *P. alpinum* by being much smaller in all its parts,—by its leaves being shorter, more erect, and nearly entire on their edges,—by its capsules being mostly erect, and its operculum ending in a long recurved mucro.

The shape of the capsule in the plate above quoted from the *Flora Danica* is not sufficiently accurate, as it does not agree either with the plant or the description of it inserted in the same work. I have therefore given a new figure of it from a specimen sent me some years ago by Dr. Swartz of Stockholm, a learned and indefatigable member of this Society, to whom I am indebted for this, and many other interesting communications.

18. *POLYTRICHUM alpinum*, fol. lineari-lanceolatis denticulato-ferratis rigidis, capsulis ovatis subnutantibus.

P. alpinum Linn. *Sp. Pl.* 1573. *Dill. Musc.* 427. *tab.* 55. *f.* 4.

Hab. in ericetis montosis, in boreali parte Europæ.

The *stalk* of this is from two to three inches in height, and divides into numerous branches.—The *leaves* are strong, stiff, linear-lanceolate, and finely ferrated on the edges with sharp minute dents: they are generally of a dark brown on the lower parts of the plant, but light green on the upper branches, where they also become brown in a dried state.—The *peduncles* are numerous, from an inch to an inch and half long, of a deep straw-colour, and issue from the summits of the branches out of close cylindrical tubes, which are about two tenths of an inch in length.—The *capsule* is ovate, tumid, and a little inclined or nodding. The *operculum* is conical and pointed.—The exterior *calyptra* is small, subulate, of a ferruginous colour, and about a third longer than the inner one.

19. *POLYTRICHUM sylvaticum*, fol. lineari-lanceolatis acuminatis ferratis rigidis, capsulis oblongis cernuis subincurvis. **TAB. 7. FIG. 6.**

Hab. in sylvis abietinis oræ occidentalis Americæ septentrionalis.

This grows from two to four inches and sometimes even to six inches in height, and is loosely divided into four or five branches; the lower part of the *stalk* is stiff and naked, but the upper part and branches are crowded with long narrow spreading leaves.—The *leaves* are linear-lanceolate, ending with setaceous points, and finely ferrated on the edges, which in a dried state turn in so as to appear channelled; the lower leaves are of a reddish brown colour, but the upper ones are of a dark green.—The *peduncles* are from an
M 2 ————— inch

inch and half to two inches long, and arise from the summits of the branches out of sheathy tubes, which are about two eighths of an inch in length; they are shining, and of a deep straw-colour at their tops, but reddish towards their bases.—The *capsule* is oblong, a little inclined and somewhat incurved, and narrower towards the rim, where it is fringed with a regular row of minute whitish dents, to the number of about sixty-four. The *operculum* is flat, with a setaceous point issuing from the centre.—The exterior woolly *calyptra* is pointed, of a light ferruginous colour, and about a third part longer than the inner one, which is of the same colour, but darker.

In reference to TAB. VI and VII. it is to be observed, that adjoining to almost every figure, the exterior *calyptra* is laid open to show the inner one.—The tubular *perichaetium* that furrounds the base of the peduncle is represented both in its natural size and enlarged.—A *leaf* of each is magnified to show its figure, and the *capsule* is exhibited either in its natural size or magnified, in order to give a more accurate idea of its shape.

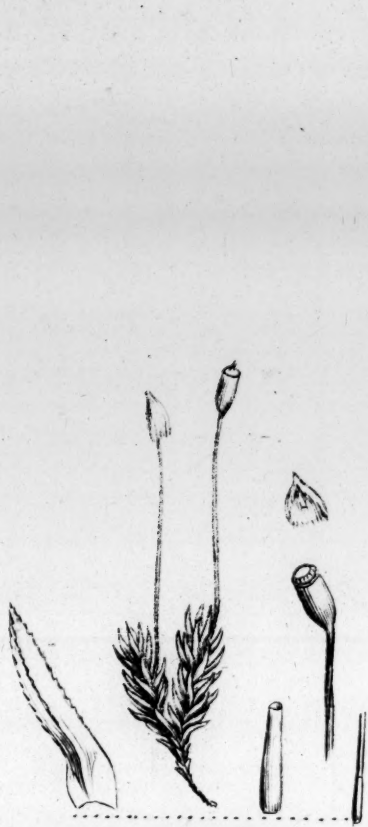


Fig. 3.



Fig. 2.



Fig. 1.



Fig. 6.

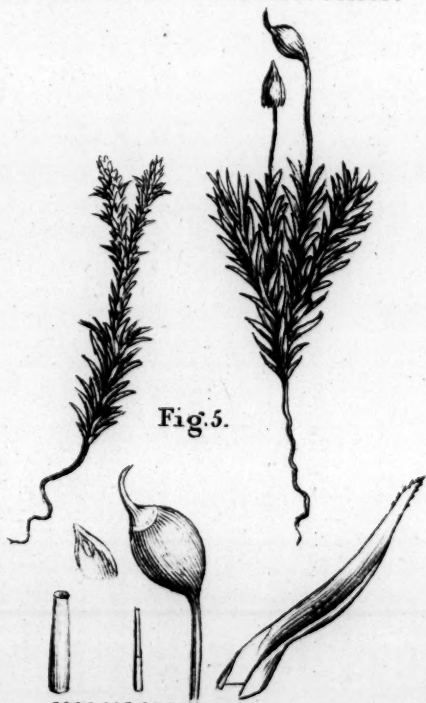


Fig. 5.

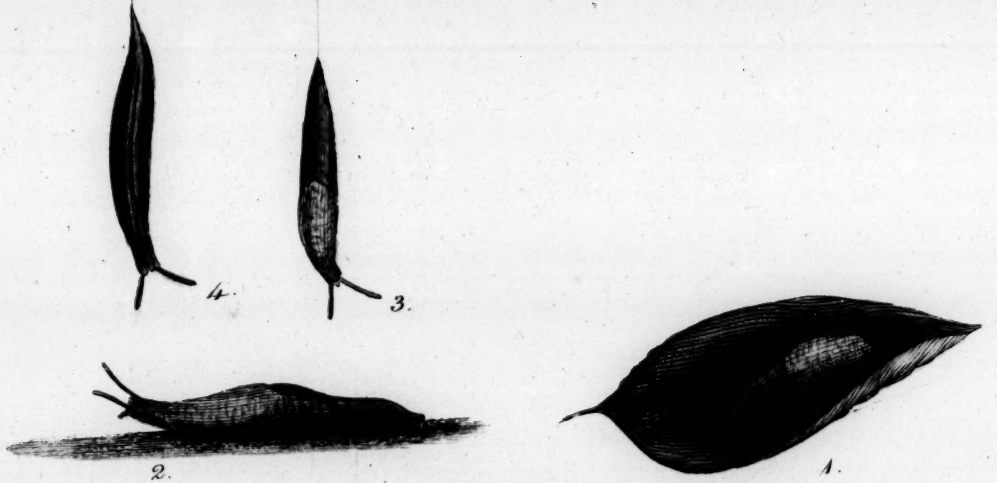


Fig. 4.





Linn. Trans. IV. tab. 8. p. 33.



Spinning Limax.



Dipus canadensis.

VII. *Observations on the Spinning Limax.* By John Latham, M. D.
F. R. S. and L. S. Romfey.

Read February 7, 1797.

THE account of the *Spinning Limax* seen and well described by Mr. Hoy, in the First Volume of the Transactions of the Linnean Society, and observed some years prior thereto by Dr. Shaw, could not fail to strike the notice of every Naturalist as a circumstance unlooked for in this tribe of beings. Amongst others my attentive and observing friend, and Fellow of this Society, Colonel Montagu, has been fortunate in residing this summer at Penryn in Cornwall, where this *Limax* or *slug* was in considerable plenty, by which means he has been enabled to draw up notes of many observations thereon, which he has communicated to me in various letters for the purpose of laying them before the Society.

The result of the Colonel's observations, omitting what Mr. Hoy has before said on the subject, is nearly as follows:—The specimens which he met with were in general from three-fourths of an inch to an inch in length, the general colour a greyish white, and the shield of a yellowish or buff-colour, as may be seen in the coloured drawing thereof. TAB. 8. *fig. 1.* shews the *slug* in a state of repose on a leaf: *fig. 2.* that of progressive motion on the ground: *fig. 3.* a view of the upper surface whilst suspended by its thread from a branch: and *fig. 4.* the same seen from beneath. That it is a custom not unusual for this species of *Limax* to pass
I from

from an height securely to the ground, by means of a thread of its own construction, seems manifest; for, on my friend's putting one of them on the projecting frame of a window, it immediately crawled forwards till it came to the projecting angle, from whence, without attempting to fix itself by its fore parts to any thing, it became visibly suspended by a thread from its tail. When it had descended about two feet, the Colonel took it up by the thread, and carried it to a distant room; but, in trying to fix it afresh, in order more accurately to observe its progress, the thread broke. He then put it on a frame about four feet from the ground; in a few minutes it was again suspended, and, observing by his watch, descended at the rate of three inches and an half in a minute. The motion was not perfectly smooth and regular, but at times slight jerks were observed. When the slug was near the ground, an attempt was made, by taking hold of the thread near to the body, to fix it afresh, but the thread again broke, as it did likewise on being tried three other times with the same view, each time the slug having nearly reached the floor. At last he fixed the end to a stick, by which he was enabled, by turning the stick round, to wind up the thread faster than it was produced. The thread however soon broke, and after these trials, although the slug made several attempts to spin, it as often fell to the ground; on which it was put into wet moss, and the next day seemed so far to have recovered the property of spinning, as again to go through the former experiments.

By the above repeated essays, the Colonel, by means of glasses, was enabled to make the fullest observations, and found for certain that the secretion, of which the thread was formed, was wholly from the under parts, and not from the back or sides, both of which appeared nearly dry; nor did it proceed from any orifice in the tail, for in some experiments it was suspended by the tip of the tail, at other times from full an eighth of an inch on one side of it. This

Limax appeared to be sensible of its abilities, for it extended itself from the bottom of the frame, with its head downwards, till the tail became suspended; and it was by means of an undulating motion of the belly, similar to that in the act of crawling, that the flow of the viscous secretion was produced towards the tail; but in doing this the belly was extremely contracted, being furnished with numerous transverse *rugæ*; at the same time the body and *tentacula* were fully extended, indicating no alarm whatever: the head was occasionally moved from side to side, which gave several turns to the right or left as the centre of gravity lay; but as it as frequently turned one way as the other, the thread was not in the least twisted. The thread, on first leaving the tail, conformed to the shape of that part, being flat, and five times as broad as at one eighth of an inch distant therefrom; but afterwards seemed of an equal size, and considerably smaller than the finest human hair. When a portion of this thread was placed under a microscope, it appeared contracted, by its surface being wrinkled; it was pellucid, and seemed elastic.

Colonel Montagu adds, that he has met with numbers of them, some of which could not by any means be induced to spin, as if sensible of their inability so to do, readily turning back when approaching the projecting edge; whilst others at once let themselves down without hesitation; so that it might be known by their motion, when near the brink of the precipice, whether they were endued with the faculty or not.

The above were the principal of the observations communicated to me, the last of which were made the beginning of October. My friend, as well as Mr. Hoy, seems to think that the subject in question is no other than the *Limax agrestis* of Linnæus, to which I most readily assent; and that it is most probably the variety mentioned by Müller in his *Hist. Verm.* II. p. 9. β. viz. *Limax albidus clypeo flavescente*; and perhaps also the var. ε. in Gmelin's edition of the *Syst.*

Naturæ

Naturæ of Linnæus, p. 3101. *Limax albus clypeo flavescente*. Lister has figured it, not inaccurately, both in his *Animal. Angliæ*, p. 130. tab. 2. f. 16. as well as in his *Synopsis Method. Conch.* as one of his *Cochleæ nudæ terrestres*, see tab. 101. A.: but both figures seem to correspond with the plain sort, in which the shield and body do not differ in colour; for he names it *L. cinereus parvus immaculatus*. However he is silent in respect to the faculty, in this identical species, of spinning a thread, although he has noticed the circumstance in the *Limax cinereus* of Linnæus, which he names *L. cinereus maximus striatus & maculatus*, p. 127. t. 2. f. 15. (the same figured in his *Synopsis*, tab. 101. a. f. d.) and delivers his sentiments, at p. 130, in the following words: “Eosdem Limaces alio tempore circa mentem Junium in sylvis opacis observavi, ex arborum ramis demissos, singulos singulis funibus bipedalibus crassis & validis factis: atque e propria saliva confectis. Est sanè magna affinitas inter humorem illum e quo araneorum erucarumque fila fiunt, atque horum animalium salivam.”

In respect to the quantity of glutinous matter sufficient for the purpose of suspension, according to Swammerdam the texture of the whole surface of the body is more or less disposed to furnish it*; but, by the above observations, we find that the glands of the belly and under parts are those which are materially subservient thereto.

* *Bibl. Naturæ*, part 1. ord. 1. cap. 6. where he says, “After what manner the slimy humour distils from the glands of the skin, may be seen in this manner: The skin must be wiped with spongy blotting paper until none of the slimy humour is seen, or till the whole is cleared off; then the skin must be taken between the fingers and pressed gently; and if this be done under a microscope, the slimy humour will be seen to come out insensibly from the glandular pores of the skin like clear and minute points: these, by continuing the pressure, will become small drops; and these, in some time, gathering together, will form a considerable collection of this matter; so that the whole skin will be moistened and become glutinous.” See *Book of Nature*, part 1. p. 54. (*Engl. Transl.*)

From what has been said it should seem no difficult matter to suppose the possibility of *every Species of the Genus Limax* being competent to the forming threads of the like kind; so far from the faculty being confined to one in particular.

The first discovery of the singularity which has given rise to the above essay, like many other things, was owing to fortuitous observation; and, to say the truth, the fact was totally unlooked for, and by many scarcely credited, although so well attested: but knowledge of every kind is slow in its progress. It is to be hoped, therefore, that no opportunity will be hereafter neglected by individuals of forwarding to the Linnean Society their observations without reserve, although such may appear at first trivial, for they may probably lead to more consequential discoveries.

Romsey, Nov. 11, 1796.

VIII. *An Essay on the Tracheæ or Windpipes of various Kinds of Birds.*
By John Latham, M. D. F. R. S. and L. S. Romfey.

Read July 4, October 3, and November 7, 1797.

THE study of Birds has for many years past occupied my attention ; and I might add, that from my earliest remembrance I have had a predilection in favour of this part of Natural History, although my researches have not been totally confined thereto. I have hereby been tempted to publish my volumes of Ornithology, which, I flatter myself, are now generally known to the world.

During my progress in the description of the external appearance of each, the criterion whereby most Ornithologists have thought it sufficient to discriminate one species from another, I have also paid some attention to the structure of the internal parts ; and, among other things, the difference in the formation of the *trachea* in many of the Duck genus, in particular, has not failed to strike my observation ; and that this circumstance will not a little contribute to assist our researches concerning the identity of several species, hitherto not a little confused, will hereafter be made to appear. But as I wished to get as much light thrown on the subject as possible ; I have postponed the publication of my observations, until by repeated dissections, and comparing many individuals with one another, I might be enabled to speak with the greater certainty. This matter has also required a much greater length of time* in respect to the Duck genus, whose history will in this essay take up a material part of

of

of our attention, as it is only at particular seasons that some of them are to be met with, and several in mild winters do not visit this kingdom, except by seeming chance, or in very small numbers. It is not possible therefore that any person of himself, however advantageously situated, can hope to meet with a sufficient number of specimens, without the assistance of others. I speak this experimentally, as without such aid I should not have been able to have furnished matter for this essay.

Amongst the various friends to whom I am obliged in respect to this undertaking, the judicious and well-informed Naturalist, William Boys, Esq. of Deal, stands deservedly foremost, having rendered me very great assistance, not only by specimens, but by every observation in his power. I find myself greatly indebted to my friend Colonel Montagu, a most diligent observer of nature; also to Mr. Lamb, Surgeon, of Reading—all Fellows of this Society. Nor should I omit my valuable correspondent Dr. Bloch, of Berlin, who has rendered himself conspicuous by several essays on the present subject, as may be seen in the Berlin Transactions*. To which must be added the observations of Doctors Pallas†, Beckmann‡, Silberschlag§, and Otton||, contained in the same works, all of which may be read to advantage; for although these gentlemen do not altogether coincide in their opinions, yet as they all tend to the same point, such efforts in order to ascertain truth must always be useful—Not forgetting due acknowledgment to the valuable paper of the late Dr. Parsons, who, many years prior to the above, gave an account of the structure of the *asperæ arteriæ*, or windpipes, of several Birds, and in the Land

* *Besch. der Berl. Nat. Fr.* iv. p. 579.—*Schrift. der Berl. Nat. Fr.* i. p. 51.

† *Besch. der Berl. Nat. Fr.* ii. p. 551.

‡ *Besch. der Berl. Nat. Fr.* i. p. 170.

§ *Schrift. der Berl. Nat. Fr.* i. p. 36.

|| *Besch. der Berl. Nat. Fr.* iii. p. 456.

Tortoise, in the Philosophical Transactions*. It is by means of the above resources, added to the observations I have myself made for a number of years, that I shall endeavour to elucidate the subject as far as in my power; and although I may not be able to determine the matter with so great a degree of precision as might be wished, it is more than probable that others, hereafter, will be able to complete the structure of which I have endeavoured to lay the groundwork.

I shall begin this essay by observing, that in most birds the natural shape of the *trachea*, *aspera arteria*, or *windpipe*, by all which names this part is known, is that of a regularly uniform cylinder of equal diameter, or nearly so, throughout, from its rise at the root of the tongue, to its entrance into the hollow of the *thorax*, *sternum*, or *breast-bone*, where it divides into two branches, called *bronchiæ*, which ramify into air-vessels which compose the two lobes of the lungs. This, I say, is the general mode of construction: but Ornithologists pretty far back† have noticed nature's deviation from this usual structure, both in respect to the various curvatures of the windpipe itself, as well as the difference of some from others in respect to conformation; but their sentiments were penned in too vague a manner to determine much thereon, not answering the purpose further than to stimulate our future researches. As far as the deviation from a cylindrical shape is concerned, it is observable that the peculiar difference in structure is seen only in the *male* sex, the *female* not having the least enlargement, or increased cavity, as will hereafter be mentioned: but to what purpose nature has intended this, is, I believe, at present unknown to us. Some authors have given as their opinion, that the enlargement of the *trachea* in males, whenever

* Vol. lvi. p. 204.

† Aldrovandus, Willughby.—See also Birch's Hist. Roy. Soc. ii. p. 13

it happens, serves to increase the tone of voice; and that this sex is enabled, by means of it, to cry out more forcibly than those birds which have no such construction of parts—an instance of which is pointed out in the *Golden-Eye Duck*, the Latin name of which (*Clangula*) has been given to it from this supposed circumstance*. Others again have supposed that the peculiarity of structure might be of use in diving; yet no one has authenticated to us, that the male is able to stay longer under water than the female. Concerning the want or presence of an enlarged cavity, or labyrinth, as authors have called it, nothing can better suit our purpose than the examples of the *Scoter* and *Velvet Duck*, the latter of which has not only an enlargement of cavity at the bottom part, but likewise a large hollow in the middle, added to a third enlargement of hollow bone just below the *larynx*; but in the first-named not the least deviation from an uniformly cylindrical shape is seen throughout the whole of its length, in either sex:—yet, wonderful to say, the *Scoter* has by far the greater facility of the two, in respect to diving and staying under the water, and on account of this property of diving becomes one of the most difficult birds to kill in its own element, as twenty shots have been made at one of these, by a good marksman, before one has taken effect. We cannot do amiss also to remind the reader, that none of the genus of *Colymbus*, *Podiceps*, or *Uria*, which have acquired the name of *Divers* from being so often under water, do enjoy any material construction of the *trachea* different from the *Cock* and *Hen*, which are well known to avoid the water from instinct. Neither can I learn that any thing occurs to outward appearance, that should enable the *Corvorant*, *Shag*, and many others, to

* Gesner supposes the name to have been given from clapping the wings at the first rising to take flight. “Ab alarum clangore, quæ firmissimæ sunt, nec sine sono in volatu moventur.” *De Nat. Av.* p. 104.

dive with such facility as they are known to do. The *Wild Swan*, in which we observe a great elongation added to a peculiar curvature of the windpipe, is able to hold its head for a length of time under water in search of food; but we have no authority for saying whether it can do so a longer time than the *Tame Swan*, in which no such peculiarity is seen. Besides, the common *Crane*, and others of the *Ardea* genus, which have not in their power even to swim, are endowed with a much greater elongation and curvature of the windpipe than the *Wild Swan*. In respect to what assistance such a construction of parts as abovesaid may afford to the tone of voice, I will not venture here to affirm; yet it cannot be denied that some birds are able to utter very loud sounds without such aid—witness the *Cock*, *Peacock*, and others*. We see Nature's operations and admire them in course, yet cannot always comprehend the utility of her works; and this seems one of her designs concerning which we are not at all clear. It, too, must be confessed, that the whole we have been able to obtain by our scrutiny into this subject is, the security of a mark of distinction, in respect to several species concerning which we have been more or less in a state of uncertainty.

I am aware likewise that anatomists have done much in regard to the discovery of sex, by observing the *testicles* of the *male*, which consist of two whitish glandular bodies placed just below the lungs, close to the back-bone, and the *ovaries*, or clusters of eggs, situated in the same place, in the *female*. It is true that the *sex* may, by at-

* How far the discovery of the dispersion of air-vessels, which are found among the fleshy parts of birds, pervading more or less even the *bones* themselves, and communicating with the lungs, may contribute to their being able to dive and stay so long under water, or whether this circumstance may assist in voice, song, or flight, is not for us here to determine. The matter is certainly worth further enquiry, but cannot make any part of this essay, further than to recommend the perusal of a Treatise on the subject by our late friend Mr. John Hunter, in the Philosophical Transactions.—See vol. lxiv. p. 205.

tending to the above circumstances, be most times got at the knowledge of; but we cannot thereby discriminate the *species*. And it is also more disappointing, that, at some seasons of the year, in particular subjects, these internal marks are so nearly obliterated as to deceive a very good comparative anatomist, and much less likely to be ascertained by any one who may be but slightly versed in such matters. But the particular circumstance of the *trachea*, as will hereafter be pointed out, never alters; except in being more or less complete in its period of ossification during the life of the bird. I ought not however to omit, that in a very careful comparison many traits of difference between one species and another may be detected by the skilful anatomist (although such may not have either labyrinth, or any enlargement of the *trachea* to distinguish them by), arising from the structure of the rings themselves, aided by the muscles appropriated to their motion; and it may be with confidence asserted, that one mean at least, if not the principal, of producing a loud noise, and on the contrary, may arise from the peculiar construction of these tracheal rings, which in many birds are found to be more or less complete in themselves; some of them wanting even a large portion of the circle, whilst others are not only perfect, but of a strong and elastic ligamentous nature, and some few so greatly indurated as to approach almost to the texture of bone*.—Added to which is the great difference of muscular appendages; for, in the birds which have a weak voice, the muscles are so likewise: on the contrary, very strong muscles are observable in those whose cry is loud, by which structure the rings, the strength of which is ever proportional, are put into violent action, and the bird thereby enabled to throw out the air with great force†. It is certain, also, that, in birds which

* As in the *Peacock*, *Goosanders*, *Smew*, and some others.

† See a curious and elaborate dissertation on this subject in *Magazin Encyclopédique*, tom. ii. p. 334 et seq.

sing, the muscles of the *larynx* are stoutest in the *male*, and in the *Nightingale* are stronger in proportion than in any bird of the same size*. We have been imperceptibly led into the above discussion, although not originally meant to form any part of our plan, intending merely to illustrate such variations of *tracheæ* as palpably differed from the usual mode, either in respect to position or structure.

The deviations in respect to the windpipe from what is generally seen, may be divided into two kinds,—The *first*, wherein this organ, although of equal diameter or nearly so, differs in being somewhat longer than the neck, and thereby allowing of a double about the middle of it, as in the *Wood Grouse*—or, being further elongated, forming one or more folds either within the keel-like process of the sternum, which is hollowed out for that purpose, as may be seen in the *Wild Swan*, *Demoiselle*, *Crane*, &c.—or, instead of entering the keel, runs more or less over the surface of the breast beneath the skin, as instanced in the *Marail*, *Barraka*, *Guan*, and others, as will be hereafter noticed.

The *second* deviation is where the windpipe is unequal in diameter, although not elongated, but alters in shape and size, and in some birds very considerably, in its progress to the lungs, more especially just before its divarication into the two *bronchiæ*, or lung-pipes.

This last circumstance has been met with hitherto only in the *Duck*† and *Merganser* genera, or at least it is in these only that the *labyrinth*‡, as it has been termed by authors, has been

* Mr. Barrington supposes that the *Nightingale* may be distinctly heard at more than half a mile, if the evening be calm. *Phil. Trans.* vol. lxiii. p. 279.

† I will not take upon me to say that other, and perhaps various kinds of, conformations of the *trachea* in the *Duck* genus may not hereafter be noticed; as we have good authority in respect to one species, where the windpipe runs on the surface of the breast in the manner of the *Guan*. See No. vi.

‡ *Ampulla* seu *Labyrinthus*, *Raii Syn. Av.* p. 135. *Will. Orn.* p. 253, et alibi. *Labyrinth*, *Will. Orn.* (Ed. Angl.) p. 335. *Ray's Letters*, p. 163.

found: and further, that it is the *male* alone which has this mark of discrimination; for although many birds may be found having the *female* plumage, in which the labyrinth is equally conspicuous with others possessing that of the other sex, yet I will venture to affirm, that this part differs not from that of an old male, except in respect to the ossification being less complete; and again, that in every specimen with such enlargement of *trachea*, or labyrinth, the *testes*, an indubitable mark of the *male* sex, will invariably be found to accompany it.

Among other errors, the *Glaucium* of authors, or *Morillon* of the French, has been recorded as a distinct species by many. This however may easily be proved a fallacy by dissection, as the bird is no other than the *Golden Eye* in imperfect feather; for this species does not attain the adult plumage for at least the first season, perhaps longer. Another bird, passing under the name of *Morillon*, proves, by the same test, to be the young of the *Tufted Duck*; and a third called *Morillon* also, merely a young *Scaup*, which I have more than once identified. Besides, were the difference of *bill* alone in these birds attended to, it could not fail to decide the matter, as they are greatly unlike each other in this particular, notwithstanding the external colour of feather might lead a superficial observer to think them the same.

The *wild Swan* is not greatly unlike the *tame* species in respect to plumage, the difference of bill at first sight appearing to be the chief external characteristic, inasmuch as to deceive some Naturalists into the supposition of their being varieties only of one and the same species*; but

* *M. de Buffon* was apprised of the difference of internal structure, but accounts for it on a singular principle, when he observes in a note: "Selon Willughby cette particularité de conformation est propre au cygne sauvage, & ne se trouve point la même dans le cygne domestique, ce que semble fonder ce que nous allons rapporter de la différence de leur

but under the eye of the Anatomist, who examines them internally, how widely do they differ!—In the *tame* one, little more occurs in respect to the windpipe than is to be seen in the common *Cock*, whilst in the *wild Swan* it is lengthened greatly, and, entering a hollow in the keel of the sternum, forms a doubling therein, before it returns to enter into the cavity and attach itself to the lungs, as will be hereafter shewn.

It seems unnecessary to say more on this subject in a general way, as the circumstances will occur in course under their particular heads: to avoid repetitions, therefore, I shall proceed to the descriptions themselves; and, first, of those birds in which the *trachea* or windpipe obtains a singularity, from its various inflexions in its passage to the lungs, without greatly deviating from the uniform and cylindrical shape, beginning with

I. TETRAO UROGALLUS—WOOD GROUS. Tab. ix. Fig. 1.

T. fusco-rufus, capite colloque cinereis, gulâ abdomineque nigris, axillis albis.

Tetrao Urogallus, *Linn. Syst. Nat.* p. 273.—*Ind. Orn.* 2. p. 634.—

Frisch. t. 107, 108.—*Raii Syn. Av.* p. 53. A. 1.—*Will. Orn.* t. 30.

Auerhahn, *Besch. der Berl. Nat. Fr.* iv. p. 589. t. 18. f. 2.

Coq de Bruyere, *Buf. Oif.* ii. p. 191. t. 5.—*Pl. Enl.* 73, 74.

Wood Grouse, Cock of the Wood, *Br. Zool.* i. t. 40, 41.—*Gen. Syn.* iv. p. 729.

In order to ascertain the species here meant, it is right to observe, that the *Wood Grouse* is well represented in the *British Zoology*, and

“voix, mais cela ne suffiroit peut-être pas pour prouver que leurs espèces soient différentes: cette diversité n’excédant pas la somme des impressions tant intérieures qu’extérieures, que la domesticité & ses habitudes peuvent produire à la longue sur une race assujettée.” *Hist. des Oif.* ix. p. 24. (f).

is also figured in the *Planches Enluminées*, as well as the Plate referred to in Frisch's work, where the reader may likewise learn the description and manners.—He will, in like manner, be directed to the synonyms of such authors as may be necessary for him to consult, in respect to the other birds mentioned in this treatise, the design of which being chiefly that of describing the organ of respiration called the *trachea* or windpipe; and as the *Wood Grouse* seems to deviate from the common road, in a less degree than others which will be hereafter mentioned, it seems most proper to begin our subject with.

The windpipe in this species, otherwise than being longer than the neck, does not furnish us with any thing material in respect to general conformation: it passes in a straight direction downwards as far as the crop, where it takes a bend upwards, and again turning downwards, goes on to the lungs in the usual way.

As the bird is very rare in this kingdom, I have never been able to examine more than one, which came from the North of Europe, and of which very little of the *trachea* remains with me, except the parts composing the bend: I have therefore availed myself of the drawing of Dr. Bloch in the *Berlin Transactions* above referred to, in order to perfect my figure, in which *a* represents the *tongue*—*bb* the *os hyoides*, or bone of the tongue, with its appendages—*c* the *larynx* with the *glottis* or orifice therein for the admission of air—*dd* muscles which accompany the *trachea*, one on each side, serving to lengthen or shorten it at the will of the bird—*f* the *trachea* or windpipe itself, forking off into two parts called *bronchiæ*, which divaricate into numberless smaller tubes, and lose themselves in the various ramifications of the lungs.

This general structure of parts is greatly similar in all birds, and will serve throughout this Essay whenever we may have occasion to speak of them, having in view such readers as may not be con-

versant in anatomy ; to those who are, it will be unnecessary to say more, and to the uninformed I should hope it may prove enough.

As far as I can learn, no particularity is observable in the windpipes of the three others of this genus which frequent this kingdom, viz. the *Black Cock*, *Red Grouse*, and *Ptarmigan*. The two first I have myself examined ; but in respect to the *Ptarmigan*, I have not as yet had an opportunity of seeing it in a recent state ; however, I am informed that nothing particular has been noticed in respect to the parts in question.

II. PENELOPE MARAIL—MARAIL TURKEY. *Tab. ix. Fig. 2.*

P. capite subcristato, temporibus gulâque incarnatis carunculatis.

Penelope Marail, *Gmel. Syst. Nat.* i. p. 734.—*Ind. Orn.* 2. p. 620.

Faisan verdâtre de Cayenne, Le Marail, *Buf. Ois.* ii. p. 390.—*Pl. Enl.* 338.

Marail Turkey, *Gen. Syn.* iv. p. 682.

This bird inhabits the woods of Cayenne and Guiana, where it is gregarious, and not unfrequently seen about houses ; it is likewise brought up tame, in the manner of our domestic poultry.

The *trachea* follows the course of the neck as far as the breast, where it rises on the outside of the flesh, being covered only by the skin and feathers, and passes downwards some way ; after which it returns upwards, and, bending over the right clavicle or collar-bone, divides into the two usual portions, entering the cavity, and joins the lungs : at the part where it makes the curve on the breast, it is kept in its place by a strong muscle, which is perceivable quite to the breast-bone. The above is observed in both sexes. The general cry is said to be not inharmonious ; except when irritated or wounded, when it is harsh and loud.

III. PHASIANUS PARRAKA—PARRAKA PHEASANT.

Tab. ix. Fig. 3.

Ph. subcristatus fuscus subtus fulvus, caudâ elongatâ apice integrâ.

Phasianus Parraka, *Gmel. Syst. Nat.* i. p. 740.—*Ind. Orn.* ii. p. 632.

Le Parraka, *Buf. Ois.* ii. p. 394.—*Mem. sur Cayen.* i. p. 378.—*Pl. Enl.* 1. 2.

Parraka Pheasant, *Gen. Syn.* iv. p. 722.

This bird is common in the woods of Guiana, and differs from the former in having the *trachea* of a much greater length, descending on the breast more than half way before it makes a turn upwards; after which it passes over the right clavicle, into the cavity of the breast. It may be observed, that in both these birds the descent is on the left side, and the ascent on the right. The *Parraka*, however, differs from the *Marail*; for the *male* only has the elongation of the *trachea*; in the *female* it passes immediately to the breast without the least singularity. This bird is said to set up a very loud cry at sun-set, which is thought to be the loudest of all birds in the new world, and to greatly resemble the word *Parraka* repeated many times together, from which it has obtained the name.

IV. PENELOPE CRISTATA—The GUAN. Tab. x. Fig. 1.

P. capite pennis erectis cristato, temporibus violaceis.

Penelope cristata, *Gmel. Syst. Nat.* i. p. 733.—*Ind. Orn.* ii. p. 619.

Meleagris cristata, *Linn. Syst. Nat.* i. p. 269.

Jacupema Raii *Syn. Av.* p. 56. 2.—*Will. Orn.* p. 165. t. 28.

Merrem. Ic. Av. ii. p. 42. t. 4.

Guan or Quan, *Edw. Pl.* 13.—*Gen. Syn.* iv. p. 680. 3.

The

The *Guan* frequents the same places as the two last birds, and like them is frequently domesticated: but in the singularity of the windpipe, it far exceeds them; for it not only descends much lower on the breast, but at the bottom part it doubles upwards for at least one third of its length:—it differs also in another particular; for, instead of making a descent on the left side, it passes down on the right, and, contrary to the others, returns upwards, and goes into the cavity of the thorax over the left clavicle.—I owe the drawing of the figure, from which my representation of it is copied, to the kindness of my late friend Sir Ashton Lever, who was induced, from its great peculiarity, to have the parts sketched as they appeared in the recent state.

V. CRAX PAUXI—CUSHEW CURASSOW. *Tab. xi. Fig. 1 & 2.*

Cr. cerâ cœruleâ, narium gibbere cristato, corpore nigricante, abdomine apiceque caudæ albis.

Crax Pauxi, *Linn. Syst. Nat. i. p. 270.*—*Ind. Orn. 2. p. 624.*—*Briss. Orn. i. p. 302.*

Hocco de Mexique, Le Pierre, *Buf. Ois. ii. p. 348.*—*Pl. Enl. 78.*—*Mem. de l'Acad. des Scien. 1781. p. 376. pl. viii.*

Cushew Curassow, *Edw. Pl. 295. f. 2.*—*Lath. Syn. iv. p. 696.*

The *trachea* in this species does not greatly differ from those of the *Parraka* and *Guan*, but appears to be the largest, in proportion to the bird, of any yet observed:—it extends on the outside of the breast under the skin in a similar manner, and first passes downward over the right pectoral muscle, going on straight quite to the end of the sternum, at which place it makes a convolution to the left for three inches in length, and somewhat in the shape of a ring; after which it returns again over the right pectoral muscle, and turns over the clavicle into the thorax.

The

The above account is extracted from a Dissertation on this bird, in the Memoirs of the Academy of Sciences; but no anatomical figures accompany it, although a good representation of the bird itself is given at the end of the Essay. This circumstance, however, is the less to be regretted, as I have been favoured with the two views annexed, from the rich and elegant Museum of John Heavyside, Esq. of Great George Street, who, amongst many curious anatomical subjects, possesses a preparation of the parts in very fine condition.

VI. ANAS SEMIPALMATA—SEMIPALMATED GOOSE.

A. grisea, capite collo femoribusque nigris, collari uropygio corporeque subtus albis, pedibus semipalmatis.

Habitat in Novâ Hollandiâ.

This seems to be a species not hitherto described; it is nearly of the size of the *wild Goose*: the bill is brown, and the cere passes on each side to the eyes; the head, neck and thighs are black; a collar of white encircles the lower part of the neck, and the rump and under-parts are also white; the legs are red, and the toes only webbed half-way from the base.

This is met with near Hawksbury river, in New South Wales, in flocks, and is there called *New South Wales Goose*. It is peculiar in that the windpipe forms several beautiful circumvolutions on the breast, under the skin, before it enters the thorax: its note is said to be tuneful and melodious; and it was observed sometimes to perch on trees, in the manner of the *Whistling Duck*.

I was favoured with a sight of a drawing of the bird, added to the above account of its manners, at A. B. Lambert's, Esq. Lower Grosvenor Street.

VII. CRAX

VII. CRAX ALECTOR—CRESTED CURASSOW. *Tab. x. Fig. 2. 3.*

Cr. cerâ flavâ, corpore nigro, ventre albo.

Crax Alector *Linn. Syst. Nat.* i. p. 269.—*Ind. Orn.* 2. p. 622.—*Briss. Orn.* i. p. 298. t. 19.

Mituporanga, *Raii Syn.* p. 56. 6.—*Will. Orn.* p. 115. t. 28.

Hocco de la Guiane, *Buff. Ois.* ii. p. 375. pl. 13.

Indian Cock, *Pitf. Mem.* t. p. 190.—*Phil. Transf.* lvi. p. 215. t. 10. fig. 3.

Crested Curassow, *Gen. Syn.* iv. p. 690.

This likewise is a bird of some peculiarity in respect to the *trachea*, which is pretty stout, and the rings in proportion: it passes in a straight direction to the bottom of the neck, at which part it loses its round form, and becomes somewhat broad and flat; it then turns backwards and upwards for more than an inch, when it doubles again forwards and downwards; after which it enters the cavity of the breast, and is distributed by its two portions into the lungs.—This circumstance takes place at the front of the keel of the sternum or breast-bone, but does not enter into the keel itself, as in the three following species.

In the Philosophical Transactions above quoted is a figure of the subject given by Dr. Parsons; it is also represented in the Plate referred to in Pitfield's translation of *Memoires pour servir à l'Histoire des Animaux*. The first of these I have thought right to copy (fig. 2.) and I have added also the figure of one which belonged to a bird in my own collection (fig. 3.), from which it differs not a little:—but I find that this part of the *trachea* is apt to vary in different specimens; for a second figure, engraved in the same Plate of Pitfield, shews the bend to be very small, appearing like a mere twist only; from which circum-

circumstance, we may conclude that other varieties may be occasionally met with.

Whether the *female* has such a conformation of parts is not in my power to determine; but it may be observed, that the two birds dissected by the Academy of Sciences, as well as my own, were *males*.

VIII. ARDEA VIRGO—DEMOISELLE HERON. *Tab. x. Fig. 4.*

A. superciliis albis posticè retrorsumque cristatis.

Ardea Virgo, *Linn. Syst. Nat.* i. p. 234.—*Ind. Orn.* 2. p. 673.

La Grue de Numidie, *Buf. Ois.* vii. p. 313. pl. 15.—*Pl. Enl.* 241.

Demoiselle or Numidian Crane, *Gen. Syn.* v. p. 35.—*Edw. Pl.* 134.

Pitf. Mem. t. p. 204.—*Phil. Transf.* lvi. p. 210. t. xi. f. 5.

This beautiful and elegant bird is well known in our menageries, and is frequently so tame as to mix with the poultry, though in the winter season it requires defence from cold. In it the *trachea* enters a cavity in the keel of the sternum for about three inches, when it returns after making a bend as in the two following species, and passes into the chest. I had, many years since, an opportunity of observing this circumstance in a specimen of my own; but, from the great length of time, the part had so far perished as to render it impossible to take a drawing from it. I am therefore constrained to copy the figure in the Philosophical Transactions, which I have not the least doubt of being sufficiently authentic.

IX. ANAS CYGNUS—WILD SWAN. *Tab. xii. Fig. 1. 2.*

A. rostro semicylindrico atro, cerâ flavâ, corpore albo.

Anas Cygnus, *Linn. Syst. Nat.* i. p. 194.—*Ind. Orn.* 2. p. 833.—

Bris. Orn. vi. p. 292. t. 28.—*Raii Syn. Av.* p. 136. A. 2.

Cygne fauvage, *Buf. Ois.* ix. p. 3.

Der Singchwan, *Beckst. Vog. Deutsch.* ii. p. 581.

Wild or Whistling Swan, *Gen. Syn.* vi. p. 433.—*Br. Zool.* ii. No. 264.—*Edw.* t. 150.—*Phil. Transf.* lvi. pl. x. p. 215. f. 1. 2.

The *Wild Swan* is a bird much less known than the *tame* species, which is every where domesticated, for it only visits this kingdom in very severe seasons;—it differs from the last, firstly, in the bill, which may be seen by comparison; and secondly, in size, being smaller. The plumage likewise is by no means of that dazzling snowy whiteness which characterises the *tame* species; but the essential and specific mark of distinction is that of the *trachea*, in which, as well as in the conformation of the breast-bone itself, it is so particularly different as to prove at once that there can be no relation whatever between the two.

The windpipe in the *Wild Swan*, meant in this place to be treated of, passes down the neck the whole of its length, after which it enters the keel of the sternum, passing backwards therein nearly the whole of its length, when it bends upwards and forwards, and then enters the cavity of the breast, to communicate with the lungs. It is not necessary to mention further particulars, as the figure of the breast-bone and *trachea* in situ will sufficiently point out the circumstance; nor is it necessary to say more in this place, than that the above structure of parts is observable in both sexes indiscriminately.

To obviate every possibility of mistake between the two species, I have thought right to exhibit a front view of the breast-bone of both, in which a large cavity may be seen in that of the wild species, sufficient to admit of the entrance and exit of the *trachea*, as well as its doubling therein; whilst in that of the *tame* Swan (Tab. xii. fig. 3.) no other structure is observable than in the common goose.

X. ARDEA GRUS—The CRANE. *Tab. xii. Fig. 4.*

A. occipite nudo papilloso, pileo remigibusque nigris, corpore cinereo, tectricibus intimis laceris.

Ardea Grus, *Linn. Syst. Nat.* i. p. 234.—*Ind. Orn.* 2. p. 624.—*Raii Syn. Av.* p. 95. A. I.—*Will. Orn.* p. 294. t. 48.

La Grue, *Buf. Ois.* vii. p. 287. fol. 14.—*Pl. Enl.* 769.

Der Kranich, *Besch. der Berl. Nat. Fr.* iv. p. 586. t. xvi.

The Crane, *Gen. Syn.* v. p. 50.—*Br. Zool.* ii. App. p. 629. pl. 6.—*Phil. Transf.* lvi. p. 208. t. II. f. 4.

In this bird the *trachea* enters the keel of the sternum in like manner as in the *Wild Swan*; with this difference, that it is doubly reflected*, as may be seen by consulting the figure. As in the *Wild Swan*, so in the *Crane*, we find that both sexes have the same conformation of parts, excepting that, in respect to the *Crane*, the *trachea* in the female does not pass near so far into the keel of it as in the male, nor is the doubling nearly so considerable.

WE now pass to birds in which the *trachea* enlarges in various parts, especially just at the angle of divarication, where it goes to the lungs; and which last circumstance, for want of a better name, authors have agreed to call by the name of *Ampulla*, or *Labyrinth*, as before observed, p. 96.

* To use the expression of Dr. Parsons, "This may be compared to a French-horn, whereas that of the *Wild Swan* is straight within the bone, and may be compared to a Trumpet; yet the entrance of this into the sternum and its exit, and its passage into the cavity of the thorax, are similar to those of the *Wild Swan*." See *Phil. Transf.* l. c.

XI. ANAS CRECCA—The TEAL. *Tab. xiii. Fig. 1.*

A. speculo alarum viridi, linea alba supra infraque oculos.

Anas Crecca, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* 2. p. 872.—*Raii Syn. Av.* p. 147. A. 6.

Petite Sarcelle, *Buf. Ois.* ix. p. 265. pl. 17. 18.—*Pl. Enl.* 947.

Krikente, *Besch. der Berl. Nat. Fr.* iv. p. 600. t. 18. f. 6.

Common Teal, *Gen. Syn.* vi. p. 551.—*Br. Zool.* ii. No. 290.—*Will. Orn.* p. 377. t. 74.

The Teal is a well known bird, and perhaps the smallest of the Duck kind. The labyrinth is in proportion to the size, as big as a large pea on one side, and spreading on the opposite part into a kind of convex shape, at the bottom of which the *bronchiæ* or lung-pipes are attached.—The *female* has no labyrinth.

XII. ANAS QUERQUEDULA—The GARGANEY.

Tab. xiii. Fig. 2. 3.

A. macula alarum viridi, linea alba supra oculos.

Anas Querquedula, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* 2. p. 872. *Raii Syn. Av.* p. 148. 8.

Sarcelle, *Buf. Ois.* ix. p. 260.—*Pl. Enl.* 946.

Winterholbente, *Besch. der Berl. Nat. Fr.* iv. p. 600. t. 18. f. 4?

Garganey, *Gen. Syn.* vi. p. 550.—*Br. Zool.* ii. No. 289. pl. 101.—*Will. Orn.* p. 377. pl. 74.

This bird measures, from bill to tail, seventeen inches, being three inches longer than the *Teal*. The labyrinth is larger, and differs considerably in shape, being nearly oval, and placed perpendicularly, so as to appear rather as a continuation of the *trachea*, than an appendage to it, as in several other species. It is externally a trifle indented on one side, in which furrow a muscle* passes, making it ap-

* Two muscles, one on each side, are seen in all fresh specimens; but, when dry, these are many times scarcely to be detected.

pear as divided into two unequal portions; on the opposite part, or that situated next the breast, it is flattened, and from the upper part of it the two *bronchiæ* have their origin.

I have some reason for affirming, that authors have unnecessarily divided the Teals into more species than really exist; for the *Teal* so called, and the *Summer Teal*, certainly constitute but one; and although *males* have been met with of the latter, it is probable that the external distinction of feather may not be fixed till the second year, or even beyond that period: it is not enough that the *testes* are visible; for, as above mentioned, that circumstance of itself can only prove the *sex*: it is to the labyrinth alone that we must have recourse in all birds which possess it; for this remains nearly the same during life. I scarcely need here observe, that the *male* alone possesses the labyrinth, not only in this, but also in every other species of Duck hitherto examined.

XIII. ANAS CLYPEATA—The SHOVELER. *Tab. xiii. Fig. 4. 5.*

A. rostri extremo dilatato rotundato, ungue incurvo.

Anas clypeata, *Linn. Syst. Nat.* i. p. 200.—*Ind. Orn.* ii. p. 856.—

Raii Syn. p. 144. A. 9. et 13.—*Bris. Orn.* vi. p. 329. t. 32. f. 1.

Le Souchet, *Buf. Oif.* ix. p. 191.—*Pl. Enl.* 971. 972.

Die Löffelente, *Schr. der Berl. Nat. Fr.* iii. p. 373. t. 7. f. 2.

Shoveler, *Gen. Syn.* vi. p. 509.—*Br. Zool.* ii. No. 280.

This bird is about two inches longer than the last, and is far from being uncommon. The end of the *trachea* is furnished with a labyrinth, which is small in proportion to the size of the bird, being scarcely more than half the size of that of the *Garganey*. It is of nearly equal dimensions throughout, except near the bottom, where it slightly enlarges; on the left side is a kind of bony bladder a little irregular in shape, about the size of a large rounceval pea, with two or three slight indentations on the sides;—from this springs
one

one of the *bronchiæ*; the other arises from a kind of bony arch, with which the *trachea* ends, and which is a trifle above the level of the top of the labyrinth.

XIV. ANAS ACUTA—The PINTAIL DUCK. *Tab. xiii. Fig. 6.*

A. cauda acuminata elongata subtus nigra, occipite utrinque linea alba, dorso cinereo undulato.

Anas acuta, *Linn. Syst. Nat.* i. p. 201.—*Ind. Orn.* 2. p. 864.—*Raii Syn. Av.* p. 147. A. 5.—*Bris. Orn.* vi. t. 34. f. 1. 2.

Canard à longue queue, *Buf. Ois.* ix. p. 199. t. 13.—*Pl. Enl.* 954.

Pfeilschwanz, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.

Pintail, *Gen. Syn.* vi. p. 526.—*Br. Zool.* ii. No. 282.—*Will. Orn.* p. 376. t. 73.

This species measures twenty-eight inches in length, and is common in our markets in the winter season. The *trachea* finishes in a bony arch like the former, from which one of the branches of divarication springs: attached to the side of this is a nearly round bony bladder, delicate in texture, and about the size of the end of the thumb; the upper surface of it about even with the top of the bony arch, but the bottom greatly below it: from which circumstance it is, independent of size, particularly distinguished from the same part in the *Wigeon*, though at first sight appearing somewhat similar. It may not be amiss here to observe, that, in young birds, this roundish bladder will suffer itself to be indented by pressure, but at mature age becomes very brittle, so as not to be handled without some care; from the under and inner part of this, the second division of the *trachea* takes rise. The opposite side is formed not greatly different, but puts on the appearance of an oval obliquely placed, in the same manner as in the opposite side of the *Gadwal*, or next species.

XV. ANAS STREPERA—The GADWAL. *Tab. xiii. Fig. 7. 8.*

A. speculo alarum rufo nigro albo.

Anas strepera, *Linn. Syst. Nat.* i. p. 200.—*Ind. Orn.* ii. p. 859.—*Raii*

Syn. Av. p. 145. A. 2.—*Bris. Orn.* vi. p. 339. t. 33. f. 1.

Chipeau, *Buf. Ois.* ix. p. 187. t. 12.—*Pl. Enl.* 958.

Gadwal or Grey, *Gen. Syn.* vi. p. 515.—*Br. Zool.* ii. No. 288.—

Will. Orn. p. 374. t. 72.

This species is about 15 inches long, but is much less common than the former. The windpipe is long, and furnished with a bony bladder and arch as in the last species, but differs in shape, and the globular part is not near so large; it is likewise elongated upwards and downwards in an oblique direction, and is a little compressed on the sides: it is also distinguished from the *Pintail* in another particular, which is, that the bony orb in that species adheres to the side of the arch by a small portion only, whereas in the *Gadwal* it is firmly fixed to it at the bottom; that portion of it which lies next to the *trachea* is flat, and in the recent state joined thereto closely by a membrane. The bony arch too is full half an inch in height, differing in this particular from that of the *Pintail*, which is scarcely three-eighths of an inch; and this proportion of parts holds good in every specimen which has come under my inspection.

XVI. ANAS PENELOPE—The WIGEON. *Tab. xiii. Fig. 9.*

A. cauda acutiuscula crisso nigro, capite brunneo, fronte alba, dorso cinereo undulato.

Anas Penelope, *Linn. Syst. Nat.* i. p. 202.—*Ind. Orn.* ii. p. 860.—

Raii Syn. Av. p. 146. A. 3.—*Bris. Orn.* vi. t. 35. f. 2.

Canard siffleur, *Buf. Ois.* ix. p. 169. t. 10, 11.—*Pl. Enl.* 825.

Pfeifente,

Pfeifente, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.

Wigeon, Whewer, Whim, *Gen. Syn.* vi. p. 518.—*Br. Zool.* ii. No. 286.—*Will. Orn.* p. 375. t. 72.

The total length is 20 inches. The *trachea* at first sight does not seem materially to differ from that of the *Pintail*, yet on a more narrow inspection will be found not to accord with it. In the first place the bony orb is smaller, not being larger than the end of the finger—both indeed seem globular, but that of the *Wigeon* is most perfectly so. They both differ likewise in point of attachment. In the *Pintail* it is united to the side of the arch on a line above the centre, in the *Wigeon* somewhat below it, and the bottom of both the orb and arch are nearly even, but in the *Pintail* the bottom of the arch is higher of the two—besides which, the bony arch itself is a little different in shape, as may be seen by comparing the two figures. The opposite parts of both put on an appearance not greatly different from those of the *Gadwal*, which makes it unnecessary to give a figure of them in that situation.

From the above comparison, it is presumed that no one will hereafter confound the last three birds together.

XVII. ANAS BOSCHAS—The MALLARD. *Tab.* xiii. *Fig.* 10.

A. rectricibus intermediis (maris) recurvatis, rostro recto.

Anas Boschias, *Linn. Syst. Nat.* i. p. 204.—*Ind. Orn.* ii. p. 850.—

Raii Syn. Av. p. 145. A. 1. 150. 1.

Canard sauvage, *Buf. Ois.* ix. p. 115. t. 7. 8.—*Pl. Enl.* 776. 777.

Die zahme und die wilde Ente, *Besch. der Berl. Nat. Fr.* iv. p. 601. t. 18. f. 5.

Mallard and Wild Duck, *Gen. Syn.* vi. p. 489.—*Br. Zool.* ii. No. 279. t. 97.—*Will. Orn.* p. 308. t. 72. 75.

This

This species is larger than any of the *Duck* genus before mentioned, except the *Swan* and *Semipalmated Goose*, and the *trachea* is stouter in proportion. The globular part is a trifle bigger than in the *Pintail*, but loses its round shape in some measure at the lower portion of it: it is likewise much less smooth on the surface, being somewhat furrowed, and marked with minute wrinkled lines. The bony arch is much deeper than in any of the foregoing, is attached to the globular part almost the whole of its length, and in some specimens measures full three-fourths of an inch. The whole of this part likewise is stronger than in any species before described. The labyrinthic or globular part of the *trachea* indeed varies a little in respect to size, both in the wild and tame sorts, but is in general larger in the domesticated ones. Much controversy has been held concerning the *Curved-billed Duck*; some supposing it to be a variety only of the *Mallard*, and others wishing to make it a distinct species. This bird has not come under our view anatomically, having only met with it in menageries, or preserved in collections; but it is to be wished that a strict comparison may be made in respect to the *trachea*, by means of which I have not a doubt of the different opinions being at once settled.

XVIII. ANAS MOSCHATA—Muscovy Duck. Tab. xiv. Fig. 1, 2.
Tab. xvi. Fig. 5, 6.

A. facie nuda papillosa.

Anas moschata, Linn. Syst. Nat. i. p. 199.—Ind. Orn. ii. p. 846.—

Raii Syn. Av. p. 148.—Frisch. t. 180.

Le Canard musqué, Buf. Ois. ix. p. 162. pl. 9.—Pl. Enl. 989.

Die Türkische Ente, Schr. der Berl. Nat. Fr. iii. p. 372. t. 7. f. 1.

Muscovy Duck, Gen. Syn. vi. p. 476.—Will. Orn. p. 381, 382.

The *trachea* in this bird is stout, and nearly of equal diameter, but

a trifle smaller towards the bottom: the bony arch, as in others, finishes the bottom part, and seems as if furnished with rings, but they are not moveable as in the rest of the *trachea*. The orbicular labyrinth is attached to the side of it; this is not smooth on the surface as in the *Pintail* and *Wigeon*, but universally rough, and irregularly furrowed with fine indented lines. The opposite side runs into a pear shape, and is placed obliquely, with the pointed end lowest, as in the two last named birds, but is flattened considerably on the surface. The bony arch on this side is smooth, having no appearance of rings, and is bent at a small angle from the *trachea*, although it constitutes a continuance of it: this is the description of the organ in a young bird.

In a specimen somewhat more advanced in age, with which I was favoured by Mr. Lamb of Reading, the bony labyrinth approaches more to a rounded shape, and is larger, but still retains the rough surface, and the appearance of bony rings on the arch seems less distinct;—and in an old bird, the drawing of which I was favoured with by Mr. Boys, the labyrinth is not only much larger in size, but is nearly globular, and the bony arch quite smooth: yet Mr. Boys observes, that the labyrinthic part is finely granulated and faintly wrinkled, and the texture firm and bony; but in this last circumstance it does not differ from the younger ones. As to that figured by Dr. Bloch, in the *Berlin Transactions*, it seems at first sight too large by many degrees; yet I will not venture to say that his figure of it is faulty, for in case the *Muscovy Ducks* ever arrive at twice the size we usually see them in England, which they are said to do in warm climates, no doubt but the labyrinth will bear its due proportion.

XIX. ANAS MARILA—SCAUP DUCK. *Tab. xiv. Fig. 3, 4.*

A. nigra, humeris cinereo-undulatis, abdomine speculoque alari albis.

Anas Marila, *Linn. Syst. Nat.* i. p. 196.—*Ind. Orn.* ii. p. 853.—

Raii Syn. p. 142. A. 6.

Die Bergente, *Besch. der Berl. Nat. Fr.* iv. p. 602. t. 17. f. 3, 4.

Scaup Duck, *Gen. Syn.* vi. p. 500.—*Br. Zool.* ii. No. 275. pl. 100.

—*Will. Orn.* p. 365.

The breadth of the *trachea* of this species, in the middle, is full half an inch; it lessens a trifle towards the top, but diminishes very considerably as it approaches the bottom, so as not to measure more than three lines where it joins the labyrinthic part; the total length is from $7\frac{1}{2}$ to 8 inches. We find the name of *labyrinth* generally given to this portion of the *windpipe* of the foregoing Ducks; and we continue the appellation, although the corresponding part in many may be more aptly compared to a *drum*, and in course the word *tympanum* might be substituted for that of *ampulla*; as this part, instead of being globular, presents a more or less flattened surface, covered over with a membrane similar to that of a drum-head, and stretched in the same manner. This drum-like labyrinth exists on the left side of the *trachea*, in respect to its situation in the neck of the bird, in the same manner as the globular labyrinths, and in the *Scaup* seems to be the most conspicuous of any that possess it. The flattened surface of the labyrinth is for the most part open, except round the rim, and has an irregular bony arch crossing it from side to side; independent of these, the surface is covered with a delicate fine elastic membrane stretched over the surface, giving the idea of the head of a drum in miniature. The lower part of the

bony rim is much stronger than any other part of it, and is curved backwards, taking into its middle one of the *bronchiæ*. The other side consists of a bony box, swelling in the middle, and furrowed by several transverse bands: from this springs the other *bronchia*.

XX. ANAS FERINA—The POCHARD. *Tab. xiv. Fig. 5, 6.*

A. cinereo-undulata, capite brunneo, fascia pectorali crisso uropygioque nigro.

Anas ferina, Linn. Syst. Nat. i. p. 203.—Ind. Orn. ii. p. 862.—

Raii Syn. Av. p. 143. A. 10.—Bris. Orn. p. 384. pl. 35. f. 1.

Millouin, Buf. Ois. ix. p. 216.—Pl. Enl. 803.

Der Rothhals, Besch. der Berl. Nat. Fr. iv. p. 602. t. xvii. f. 5, 6.

Poker, Pochard, Red-headed Wigeon, Gen. Syn. vi. p. 523.—

Br. Zool. No. 284.—Will. Orn. p. 367. t. 72.

The *trachea* of the *Pochard*, at first sight, seems to be similar to that of the *Scaup*, but, on investigation, will be found to differ considerably. In the first place, it is full two inches shorter; it is also of very nearly the same dimensions throughout, or narrowing very little at the bottom. The drum-like labyrinth approaches greatly to that of the *Scaup* in texture, but is more round on the upper side; it is however crossed by a small bony partition as in that bird—in both cases, as may be supposed, by way of strengthening the membrane which covers the cavity. The bony box, of which the other portion of the labyrinth consists, is scarcely elevated on this side, and on the other much less so than is seen in the *Scaup*; it likewise forms an obtuse angle with the rest of the *trachea*, but in the *Scaup* it does not deviate from a continuation of a straight line, although forming a considerable enlargement.

XXI. ANAS

XXI. ANAS FULIGULA—TUFTED DUCK.

A. cristâ dependente, corpore nigro, abdomine speculoque alarum albis.

Anas Fuligula, *Linn. Syst. Nat.* i. p. 207.—*Ind. Orn.* ii. p. 869.—

Raii Syn. Av. p. 142. A. 7.—*Brif. Orn.* vi. p. 411. t. 37. 1.

Morillon, *Buf. Ois.* ix. p. 227. t. 15.—*Pl. Enl.* 1001.

Europaische Haubente, *Besch. der Berl. Nat. Fr.* iv. p. 603.

Tufted Duck, *Gen. Syn.* vi. p. 540.—*Br. Zool.* No. 274.—*Will. Orn.* p. 365. pl. 73.

The *trachea* in the *Tufted Duck* is similar in some respects to that of the *Scaup*, in others to that of the *Pochard*. The drum-like portion of it resembles the same part in the last-named bird, inasmuch as scarcely to be distinguished from it; but the bony box-like portion of it is elevated, and not otherwise to be distinguished from that of the *Scaup*, than in being smaller. The *trachea* itself is of equal dimensions throughout, though smaller than either of the foregoing. By attending to these particulars it cannot be mistaken for any other, and in course will prevent the occasion of giving a representation in order to identify it.

XXII. ANAS TADORNA—The SHIELDRAKE. *Tab. xv. Fig. 8, 9.*

A. rostro fimo, fronte compressa, capite nigro-virescente, corpore albo variegato.

Anas Tadorna, *Linn. Syst. Nat.* i. p. 195.—*Ind. Orn.* ii. p. 854.—

Raii Syn. Av. p. 140. A. 1.—*Brif. Orn.* vi. p. 344. pl. 33. f. 2.

Die Brandente, *Schr. der Berl. Nat. Fr.* iii. p. 373. t. vii. f. 3, 4.

Shieldrake, *Gen. Syn.* vi. p. 504.—*Br. Zool.* ii. No. 278.—*Will.*

Orn. p. 363. pl. 70, 71.

The

The *Shieldrake* is one of the most beautiful of the Duck genus, and the lower part of the *trachea* in the male is of a singular construction, being not strictly similar to any of the foregoing; it is pretty long, and nearly of equal dimensions, except towards the bottom part, where it lessens somewhat: just above the divarication are two bony kind of roundish bladders, one larger than the other, of unequal surface, and most delicate texture, being of so tender a fabric as scarcely to bear the pressure of the finger, without indenting in young subjects, or breaking in older ones; and, when dry, putting on more or less of a shrivelled appearance, though in a recent state they appear to be nearly transparent. Though so greatly different from the same part in the *Mallard*, as before described, yet its voice is said not to be unlike that bird.

WE now proceed to some birds, in which not only an enlargement at the lower end of the *trachea* is observable, but likewise the *trachea* itself is either dilated, or otherwise enlarged, and sometimes in more places than one.

XXIII. ANAS CLANGULA—The GOLDEN EYE DUCK.

Tab. xv. Fig. 1, 2.

A. nigro alboque varia, capite tumido violaceo, sinu oris macula alba.

Anas Clangula, Linn. Syst. Nat. i. p. 201.—Ind. Orn. ii. p. 867.—

Raii Syn. Av. p. 142. A. 8.—Briss. Orn. vi. p. 416. t. 37. f. 2.

—Frisch. t. 183, 184.

Le Garrot, Buf. Ois. ix. p. 222.—Pl. Enl. 802.

Die Quackerente, Besch. der Berl. Nat. Fr. iv. p. 599. t. xvii. f. 1, 2.

Golden Eye, Gen. Syn. vi. p. 535.—Br. Zool. No. 276.—Will. Orn. p. 368. t. 73.

In

In the *Golden Eye* the windpipe is of a curious and wonderful structure, for the labyrinth is not only of a different and much more complicated form than any of the foregoing, but a singular enlargement takes place about the middle of the *trachea* itself. This ventricose part consists of divers joints or plaits placed obliquely, and folding over each other so as to admit of its being contracted into a very short compass, or dilated to a great distance, as the lengthening or shortening of the neck may require. In the recent state, these rings are easily, by compression, folded into a space of little more than an inch, and, by drawing out, may be made to occupy the length of four inches, or even longer; and being of a cartilaginous nature, they recover their tone after being drawn out, if left to themselves.

It is manifest that the structure of the *trachea* in this bird being so very unlike that of any other, will ever prevent its being confounded with a different species; and on this account I can with confidence assert, that the *Anas Glaucion* of Linnæus, or *Morillon*, commonly so called, has no existence taking it as a species, for it is merely the *Golden Eye* in incomplete plumage. But this is not the only one known by the name of *Morillon*, for a specimen put into my hands for that bird has proved to be the young of the *Tufted Duck*, and others that of the *Scaup*. Whatever share the structure of this singular kind of *trachea* may have in promoting the loudness of the voice, I will not here insist on; but it is notorious that the cry is heard further off than in many others of the genus.

XXIV. ANAS FUSCA—VELVET DUCK. *Tab. xv. Fig. 3—7.*

A. nigricans, palpebrâ inferiore speculoque alarum albis.

Anas fusca, *Linn. Syst. Nat.* i. p. 196.—*Ind. Orn.* ii. p. 848.—

Raii Syn. p. 141. *A.* 4.—*Frisch.* t. 165.

Grande Macreuse, *Buf. Ois.* ix. p. 242.—*Pl. Enl.* 956.

Velvet Duck, *Gen. Syn.* vi. p. 482.—*Br. Zool.* No. 272. t. 96.—

Will. Orn. p. 363. t. 70.

The *trachea* here is more conspicuous on account of the bony dilatation in the middle of it than for any other circumstance: indeed a manifest difference from any other may be observed just below the *larynx*, being an oblong bony cavity of nearly an inch in length. From this part the *trachea* descends for near two-thirds of its length, when it swells out into a strong bony hollow, flat on one side, and moderately convex on the other, about the size of a small walnut. At the divarication the parts again lose their rings, and become bony, not greatly enlarged, but equally so on both sides—the two *bronchiæ* taking rise at the under part of this last bony hollow. I have observed some diversity in the *tracheæ* of this species, and in one in particular the hollow round bone was less ossified; besides which, the oblong bone next the *larynx* differed much in being shorter, (Fig. 6.) as also the bony part at the bifurcation of scarcely more than half the dimensions, (Fig. 7.)—which last circumstances taken together seemed to prove its being a young bird.

WE now close the account of such species of the *Duck Tribe* as the males of them have somewhat in the conformation of the *trachea* differing from the other sex; and I flatter myself, that, by means of the preceding descriptions, aided by engravings of the parts in question, the reader will find every thing as clear as was meant to be.

Endeavouring to add to this list, I have examined several others of the *Duck* genus, as the *Grey Lag*, *White-fronted*, *Bean*, *Bernacle*, *Brent* and *Scoter*; in none of which have I ever found any thing remarkable.—But I mean not to desist from the enquiry, and recommend attention to it by others; for I trust that many singular and curious occurrences will be disclosed on a further investigation of the subject.

WE

WE pass now to the *Merganser* or *Goosander* tribe, in every species of which frequenting this kingdom somewhat occurs worthy of notice.

XXV. *MERGUS SERRATOR*—RED-BREASTED MERGANSER.

Tab. xvi. Fig. 1, 2.

M. crista dependente, pectore rufescente variegato, collari albo.

Mergus Serrator, *Linn. Syst. Nat.* i. p. 208.—*Ind. Orn.* ii. p. 829.

Raii Syn. Av. p. 135. A. 4.—*Bris. Orn.* vi. p. 237. pl. 23.

Le Harle huppé, *Buf. Ois.* viii. p. 273.—*Pl. Enl.* 207.

Der Haubentaucher, *Schr. der Berl. Nat. Fr.* iii. p. 374. t. 7. f. 5.

Meerachen, *Beckst. Vog. Deutsch.* ii. p. 732, Note *.

Red-breasted Merganser, *Gen. Syn.* vi. p. 423.—*Br. Zool.* No. 261.

t. 93.—*Will. Orn.* p. 336. t. 64.—*Edw.* t. 95.

The whole of the *Merganser* genus, on outward inspection, seems greatly allied to that of the *Duck*, and to differ chiefly in the bill, which, instead of being flattish, thick, and rounded at the end, is long and narrow, having the edges furnished with numerous sharp processes like the teeth of a saw, which has given rise among sportsmen to the name of *Saw-billed Ducks* or *Divers*. In the *Duck* genus the *trachea* will be found to be more or less composed of gristly rings, approaching indeed in many very nearly to bone, and connected to each other by means of cartilaginous membranes, except in the labyrinthic parts, which are truly bone; but in the *Merganser* tribe the whole seems to be composed of little else than bone, and, in the species now before us, the bony rings or plaits fold over one another in a remarkable manner, as may be seen in the figure. It is in this too, as in the genus of *Duck*, that the singularities observed in the *trachea* are only in the male sex. But, to the point——

The *Red-breasted Merganser* has an enlargement of the *trachea* about the middle of its length, imitating that of the *Golden Eye*, in the same place, but differing, as before observed, in being bony instead of cartilaginous, and the bony plaits of which it consists being most curiously furrowed or channelled transversely: besides this, the lower part of the *trachea* ends in a large and remarkable bony cavity, of an irregular heart shape, with two openings on one side, and one on the other; all of which are covered with fine membranes, in the same manner as before observed in the *Scaup*, *Gadwal*, and *Tufted Ducks*: from the bottom of this triangular bony box the two *bronchiæ* arise, and from thence lose themselves in the lungs, as in other subjects.

XXVI. MERGUS MERGANSER—GREATER GOOSANDER.

M. crista longitudinali erectiuscula, pectore albido immaculato, rectricibus cinereis scapo-nigricante.

Mergus Merganser, *Linn. Syst. Nat.* i. p. 208.—*Ind. Orn.* ii. p. 828.

Raii Syn. Av. p. 134. A. 1.—*Briss. Orn.* vi. p. 231. t. 32.

Le Harle, *Buff. Ois.* viii. p. 267. t. 23.—*Pl. Enl.* 951.

Tauchergans, *Besch. der Berl. Nat. Fr.* iv. p. 594. t. 18. f. 3.—

Beckst. Vog. Deutsch. ii. p. 724, Note *.

Merganser or Goosander, *Gen. Syn.* vi. p. 418.—*Br. Zool.* No. 260.

t. 92. f. 1.—*Will. Orn.* p. 335. t. 64.

A sufficient idea of the *trachea* of this species may be formed by a comparison with that of the foregoing. In respect to the large bony case at the bottom, it is greatly similar; but the upper part of the *trachea* differs in having two enlargements instead of one: the first placed about one third from the *glottis*, or entrance at the top; the second nearly midway between the first and the bottom. This

is

is figured, among others, in the *Berlin Transactions*, by Dr. Bloch, as above referred to in the Synonyms.

From the scarcity of the *Merganser* tribe in this kingdom, sufficient opportunities rarely occur to enable us to ascertain many points about them as might be wished for. I am, however, now inclined to believe, as hinted in another place*, that the *Goosander* and *Dun Diver* form but one species, and that the former is the *male* bird. What has, I believe, led us hitherto to suppose otherwise, is the custom of this species of the two sexes separating after breeding time; the *old males* associating together in one flock, and the *females*, with the *young birds* without discrimination, forming a separate company; sufficiently accounting for the flocks of these latter being most numerous: from this cause, and the plumage of the *male* being for a certain season not unlike that of the *female*, and especially dissection proving that many males are always among them, the wonder ceases that the birds in question should have been set down by many writers for different species.

In *Germany* these birds are sufficiently plentiful, and the ornithologists of that country have written much concerning them; the result of which is, that the *Merganser* is considered by them as the *male*, and the *Dun Diver* the *female*, and the *Castor* of Linnæus not at all distinct, nor otherwise than the young bird. It would take up too much room here, in this Essay already sufficiently long, to detail what Dr. Pallas †, Professor Beckmann ‡, and Dr. Otto §, have said on this subject in the *Berlin Transactions*; but I should not do these Gentlemen justice, did I not recommend the perusal of their various Dissertations, which may be read with equal pleasure and advantage.

* *Gen. Syn.* vi. p. 423.

† *Besch. der Berl. Nat. Fr.* ii. p. 551.

‡ *Besch. der Berl. Nat. Fr.* i. p. 170.

§ *Id.* iii. p. 456.

XXVII. MERGUS ALBELLUS—The SMEW. *Tab. xvi. Fig. 3, 4.*

M. crista dependente, occipite nigro, corpore albo, dorso temporibusque nigris.

Mergus Albellus, *Linn. Syst. Nat.* i. p. 209.—*Ind. Orn.* ii. p. 831.

Raii Syn. Av. p. 135. A. 3.—*Bris. Orn.* vi. p. 245. t. 24. f. i.

Petit Harle huppé, La Piette, *Buf. Ois.* viii. p. 271. pl. 24.—*Pl. Enl.* 449.

Die weisse Nonne, *Besch. der Berl. Nat. Fr.* iv. p. 596. t. 18. f. 7.

Die weisse Tauchente, *Beckst. Vog. Deutsch.* ii. p. 738.

Smew or White Nun, *Gen. Syn.* vi. p. 428.—*Br. Zool.* No. 262.—*Will. Orn.* p. 255. t. 64.

This beautiful bird is considerably smaller than the two last described, and the authors above referred to will point it out should any one be ignorant of the species. The size of the *trachea* is smallest near the upper part, but enlarges as it approaches towards the middle; from whence to the bottom part it continues of nearly equal dimensions, the texture consisting of bony rings, with scarcely any cartilage appearing to intervene. At the bottom part is a bony cavity as in the others, but of a different form, being much smaller in proportion, and differing in shape, the greater expanse being from side to side, whereas in the others it is almost upwards and downwards: on one side is a round hole covered by a drum-like membrane, and on the opposite an oval smooth hollow bone uniting with it; from the bottom of these arise the *bronchiæ*.

In this, as in the former, two species have been created out of one, and owing precisely to the same cause; which is, that of the *young male* having the *female* plumage for some length of time after growing to size. I have detected this some time since by the labyrinth

ninth of the supposed *male* of the *Mergus minutus* of Linnæus being in all respects similar to that of the *Male Smerw*, added to the assurance of some later writers, who have likewise ascertained the fact, and penned their thoughts on the subject. It therefore may be concluded that we have no more than three distinct species of *Merganser* which migrate into this country.

THERE are several other birds, besides the above, concerning which I fear we shall hereafter find ourselves mistaken; but this is not the place for such investigation. The great increase in number of Gentlemen who make Natural History their study, will no doubt greatly contribute to detect many errors which have hitherto been received as facts for want of due enquiry.

EXPLANATION OF THE PLATES.

TAB. IX.

Fig. 1. The *trachea* or windpipe of the *Wood Grouse*, or *Cock of the Wood*, with its several appendages.—*a*. the tongue; *b b*. the *os hyoides*, or tongue bone, with its parts; *c*. the *larynx*, with the orifice therein for the admission of air; *d d*. muscles which accompany the windpipe, one on each side; *e e e*. the *trachea*.

2. The *Manail Turkey*, serving to shew the circumstance of the *trachea* rising above the flesh on the breast before it goes to the lungs.

3. The *Parraka Pheasant*, in which the same singularity is observed in respect to the *trachea*, but in a greater degree, running down the breast the greater part of its length.

TAB.

TAB. X.

- Fig. 1. The *Guan*—In this the *trachea* is much more elongated than in either of the foregoing, infomuch as to double upwards in a remarkable manner.
2. Part of the windpipe of the *Indian Cock*:—*a a.* the two *bronchiæ*, or lung-pipes.
3. A figure of the same taken from a different subject, serving to shew how this part appears in some specimens.
4. The *trachea* of the *Numidian Crane*, or *Demoiselle*.

TAB. XI.

Two views of *Cushew Curassow*.

- Fig. 1. A side view of the parts as they appear on dissection:—
a. pectoralis minor muscle; *b.* its tendon; *c.* the sternum; *d.* pectoralis major muscle; *e.* the clavicle; *f.* the *glottis*; *g.* the *trachea* descending; *h.* the part where it begins to form the convolutions; *i.* the convolutions; *k.* the *trachea* where it dips into the thorax; *l.* strong elastic fibres continued almost the whole length of the *trachea*, which has a fleshy origin in the thorax (see o. fig. 2); *m.* the part which answers the same office as the ribs in other animals; *n.* muscles terminating in fascia.
2. The parts seen in a nearly opposite situation:—*a.* pectoralis minor; *c.* the sternum; *d.* pectoralis major; *e.* the clavicle; *g.* the descending part of the *trachea*; *h.* the part where it begins to form the convolutions; *i.* the convolutions; *k.* the part where it has entered the thorax; *l.* the fibres which are continued from o. where they are fleshy; *m.* the parts which answer to the ribs; *n.* a muscle terminating in fascia;

fascia; *o.* the muscle (one on each side), which assists in respiration and in straitening the *trachea*.

TAB. XII.

- Fig. 1. The sternum or breast-bone of the *Wild Swan*, with the *trachea* in its proper situation.—The outer part of one side of the keel is taken off, in order the better to expose the internal contents to view.
2. The sternum with the keel seen in front, serving to shew the opening into which the *trachea* enters and returns.
 3. A similar view of the same parts in the *Tame Swan*.
 4. A view of the sternum of the *Crane*, with the *trachea* in situ, —part of the keel taken away as in fig. 1.

TAB. XIII.

- Fig. 1. The *trachea* of the *Teal*, the whole of its length.
2. The *trachea* of the *Garganey*.
 3. An opposite view of the same:—*a a.* two muscles, placed one on each side the labyrinth, very conspicuous while recent.
 4. The *trachea* of the *Shoveler*.
 5. The same seen in an opposite direction.
 6. The lower part of the *trachea* of the *Pintail*.
 7. Ditto of the *Gadwall*.
 8. The last shown on the opposite side.
 9. The *trachea* of the *Wigeon*.
 10. Ditto of the *Mallard*.

TAB. XIV.

- Fig. 1. The *trachea* of the young *Moscovy Duck*. (See that of the old one in TAB. XVI. f. 5, 6.)
2. The same seen on the other side.

Fig. 3.

Fig. 3. The *trachea* of the *Scaup Duck*.

4. The opposite side of the same:—*aa*, an oblique muscle serving to unite the base of the *bronchiæ* or lung-pipes, and may be traced in most subjects whilst recent.

5. *Trachea* of the *Pochard*.

6. The same in an opposite direction.

TAB. XV.

Fig. 1, 2. Two views of the windpipe of the *Golden Eye*.

3. *Trachea* of the *Velvet Duck*.

4. The bony case of the last below the *larynx*, seen on the opposite side.

5. An opposite view of the bony hollow of the middle part.

6. View of the uppermost bony case taken from a different subject, serving to shew how this part appears in some specimens.

7. View of the bottom part of the same *trachea*.

8. *Trachea* of the *Shieldrake*.

9. View of the same, seen on the opposite side.

TAB. XVI.

Fig. 1. *Trachea* of the *Red-breasted Merganser*.

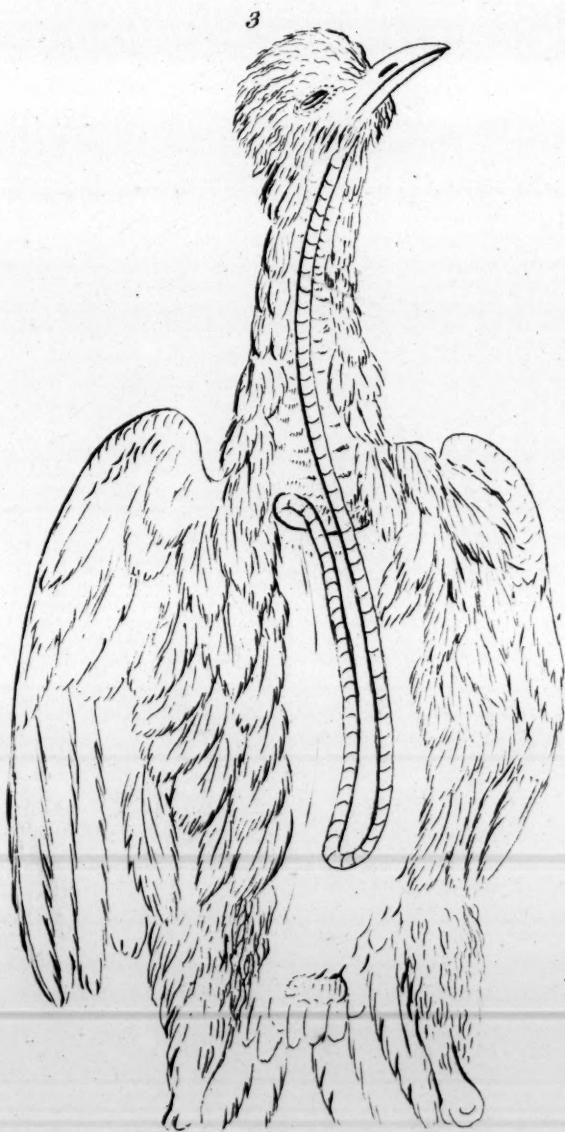
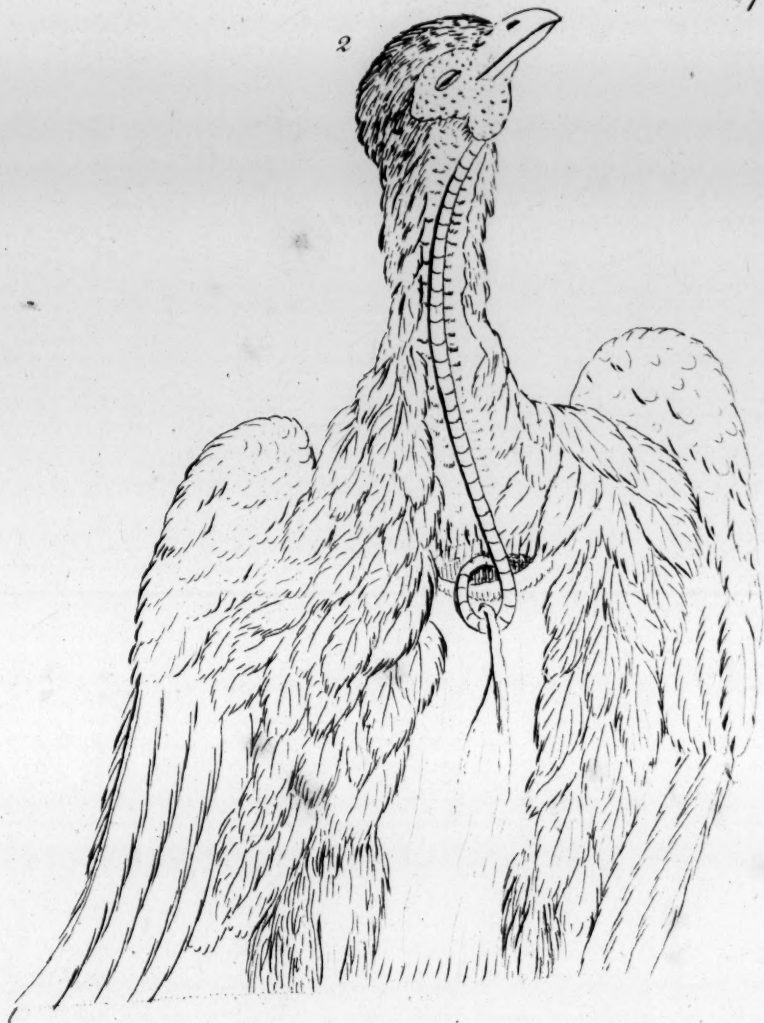
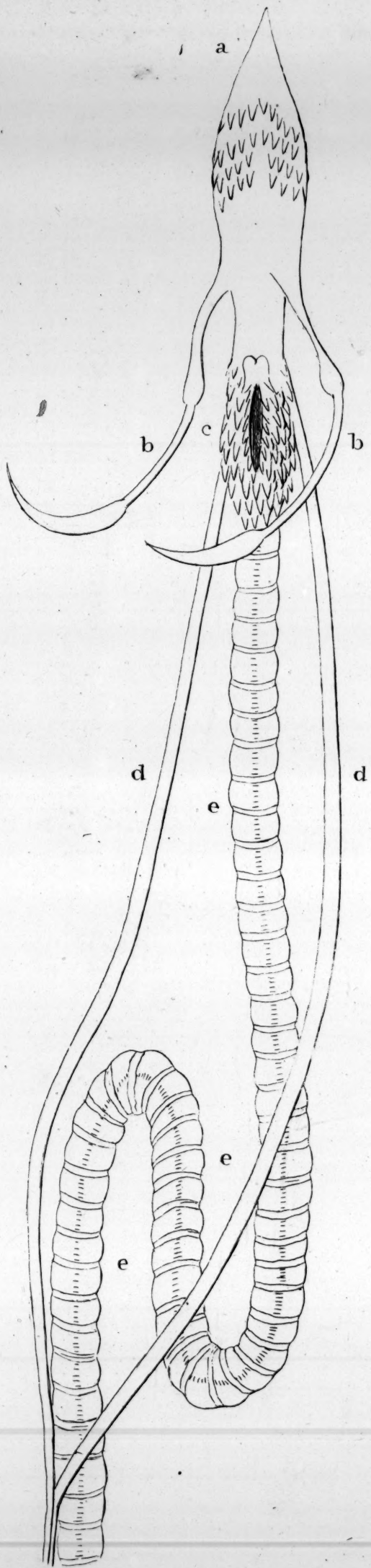
2. Ditto seen in the opposite direction.

3. *Trachea* of the *Smew*.

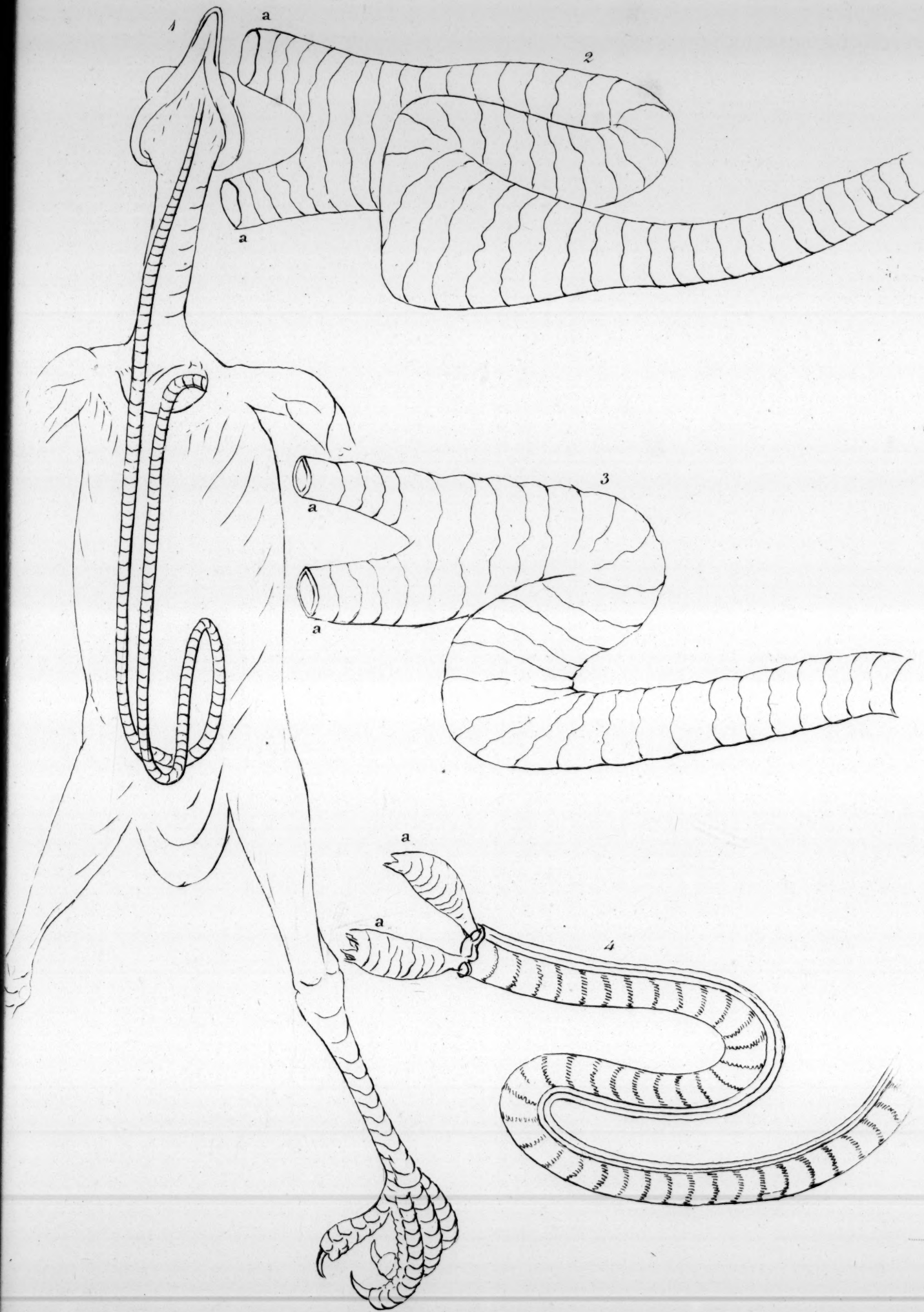
4. An opposite view of the same.

5. The *trachea* of an *Old Muscovy Duck*. (See that of a younger one in TAB. XIV. f. 1, 2.)

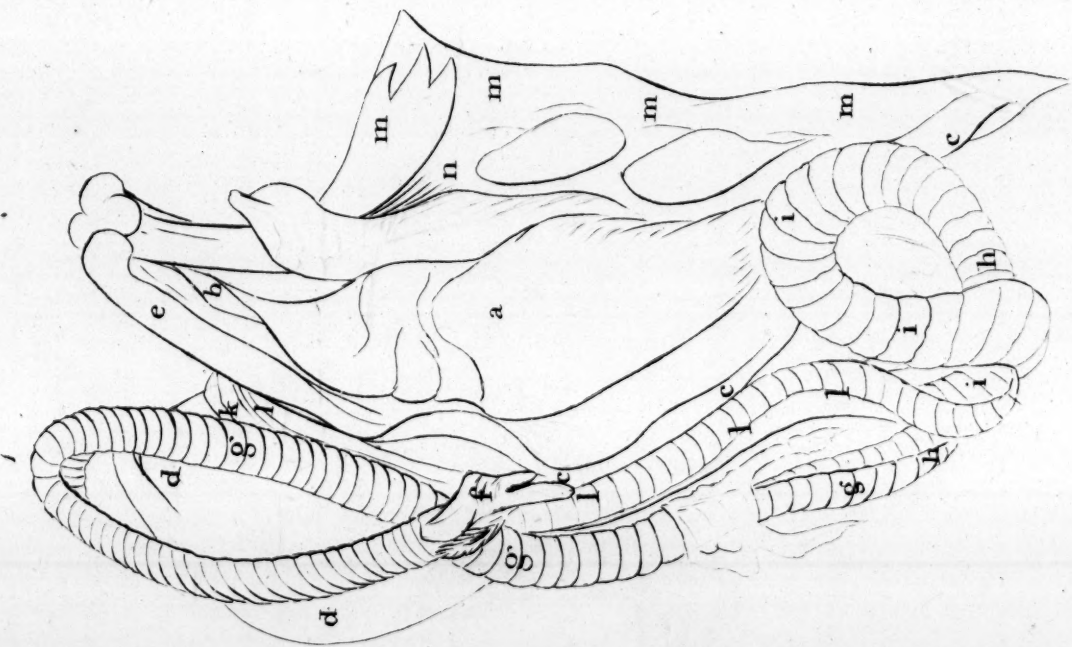
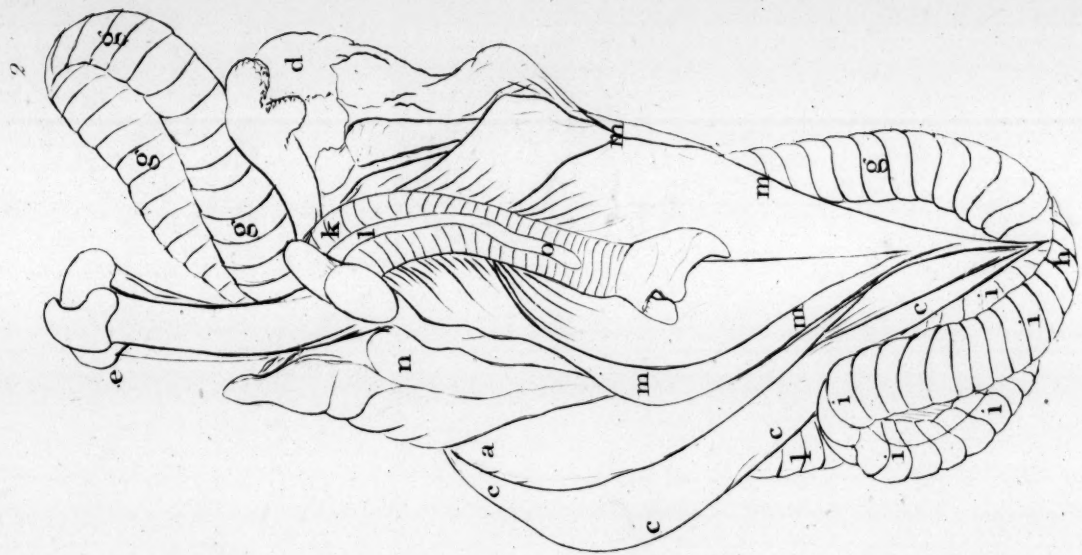
6. The same seen on the other side.





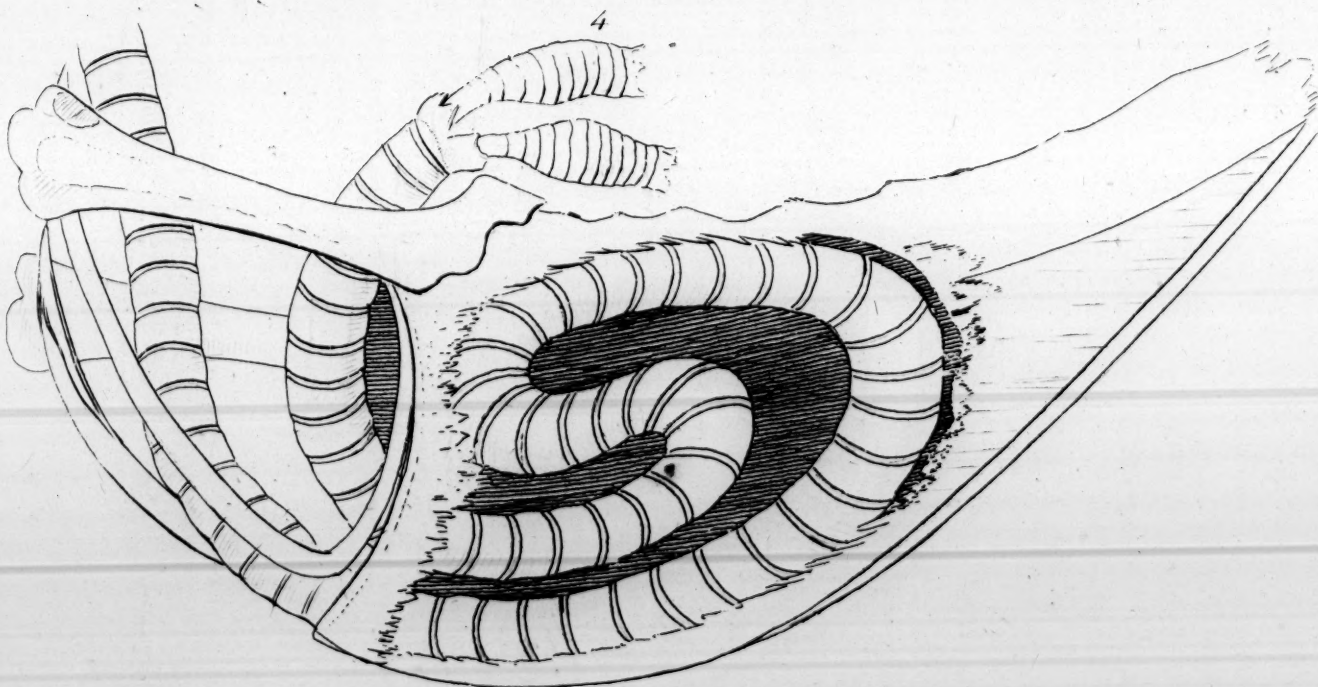
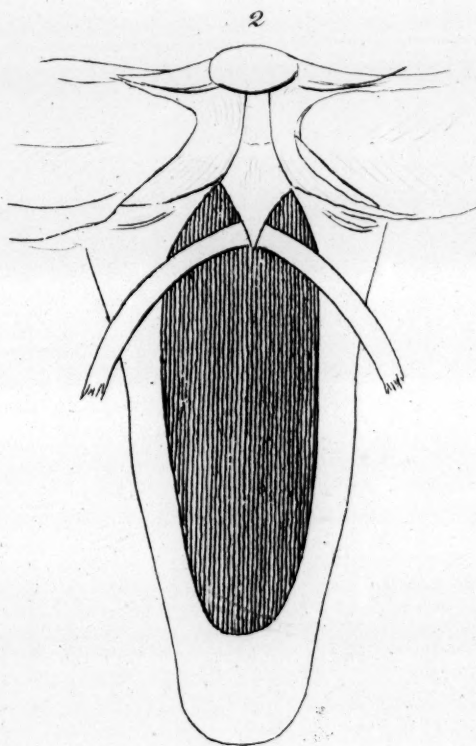
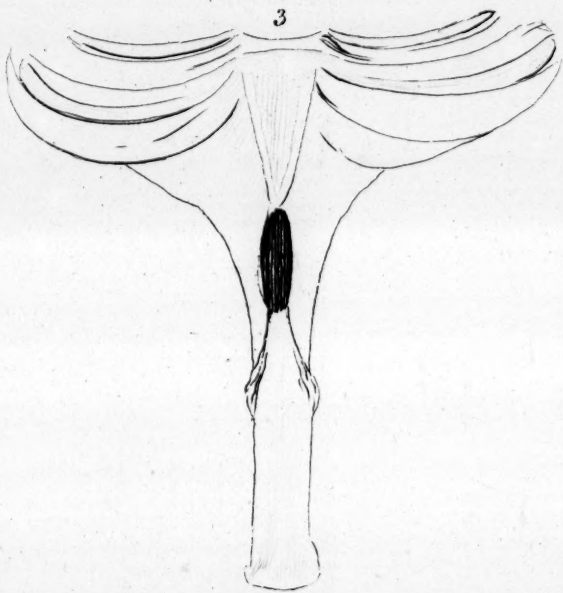
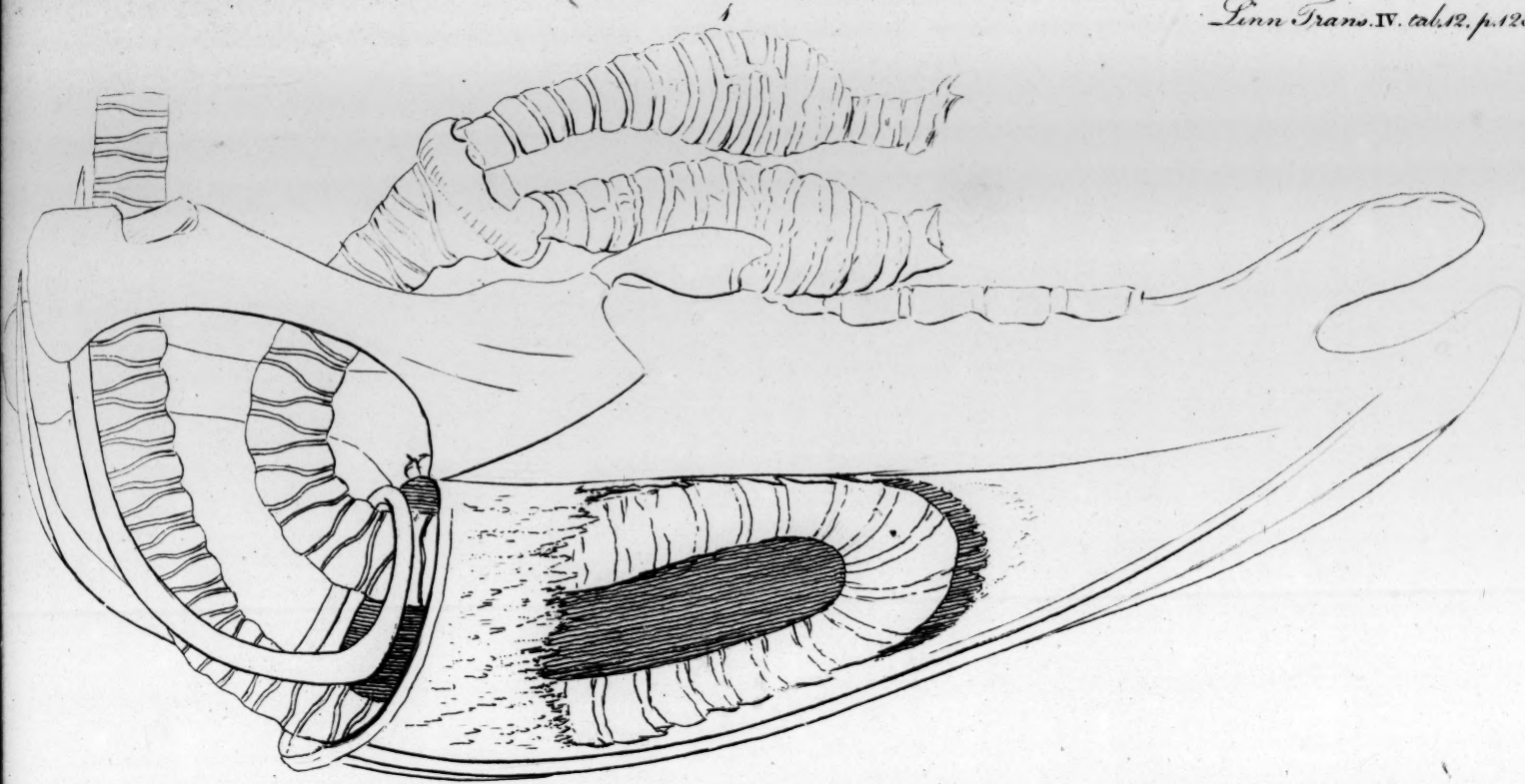




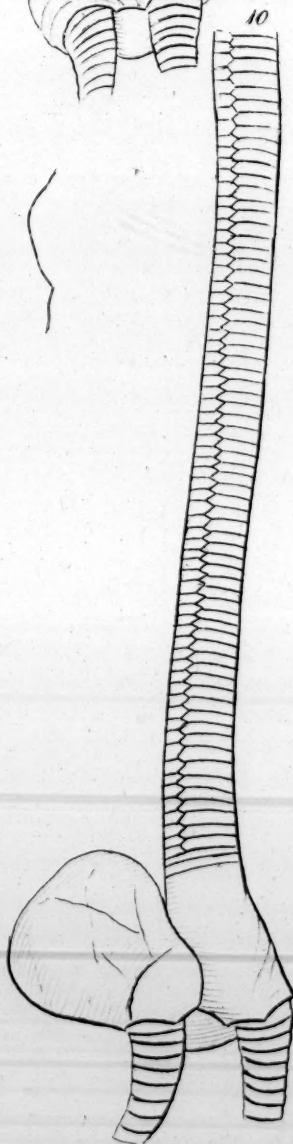
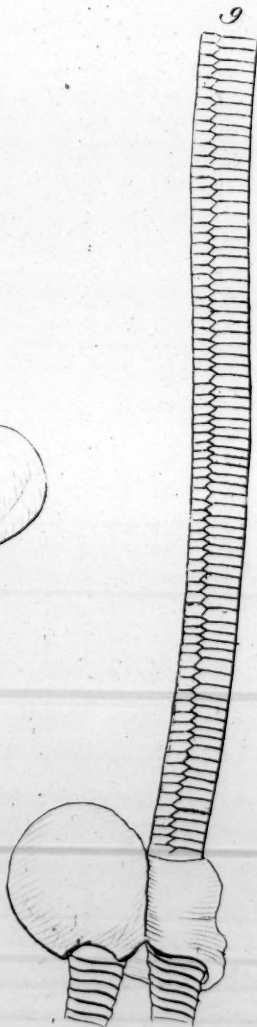
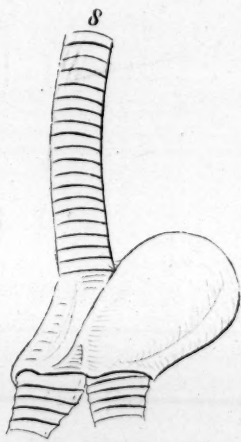
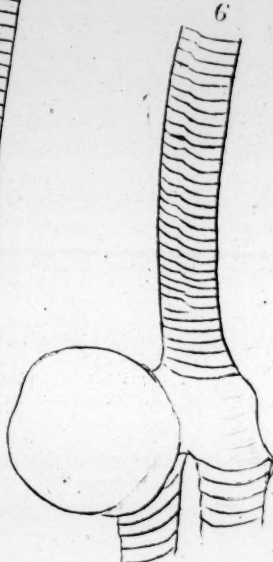
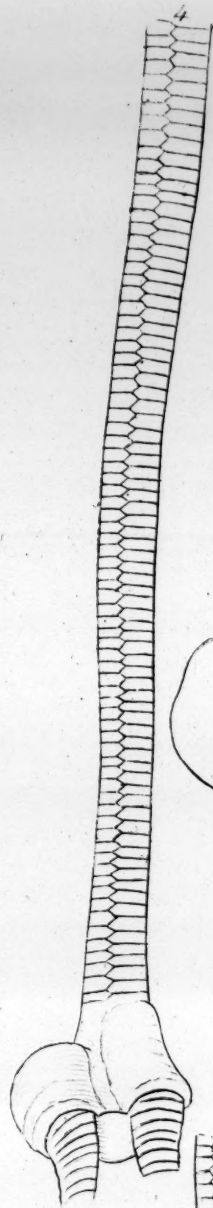
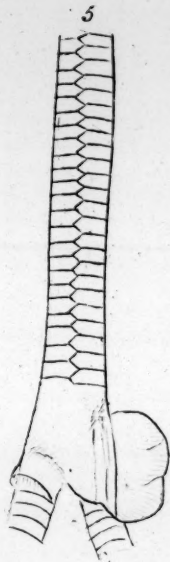
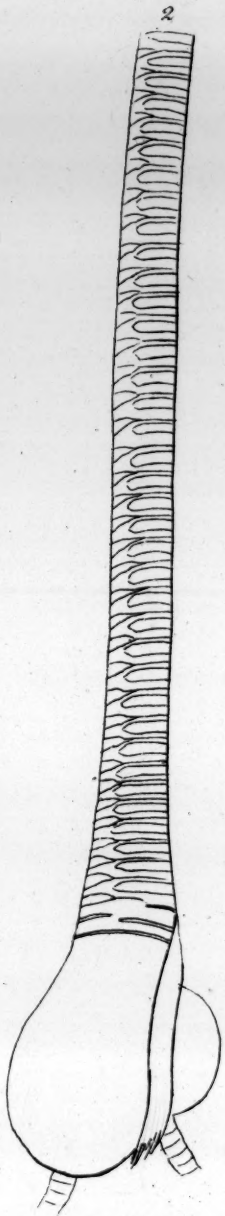
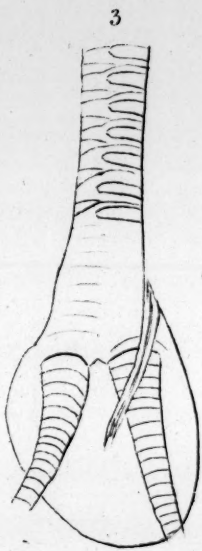
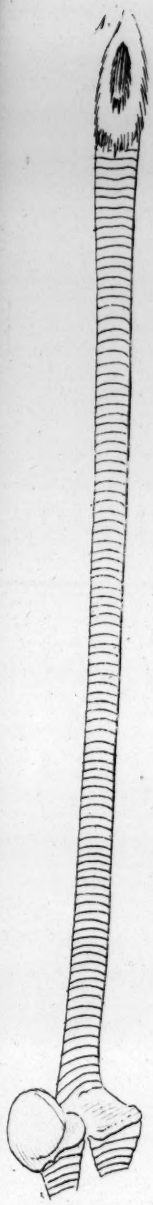


J. L. de la Harpe.

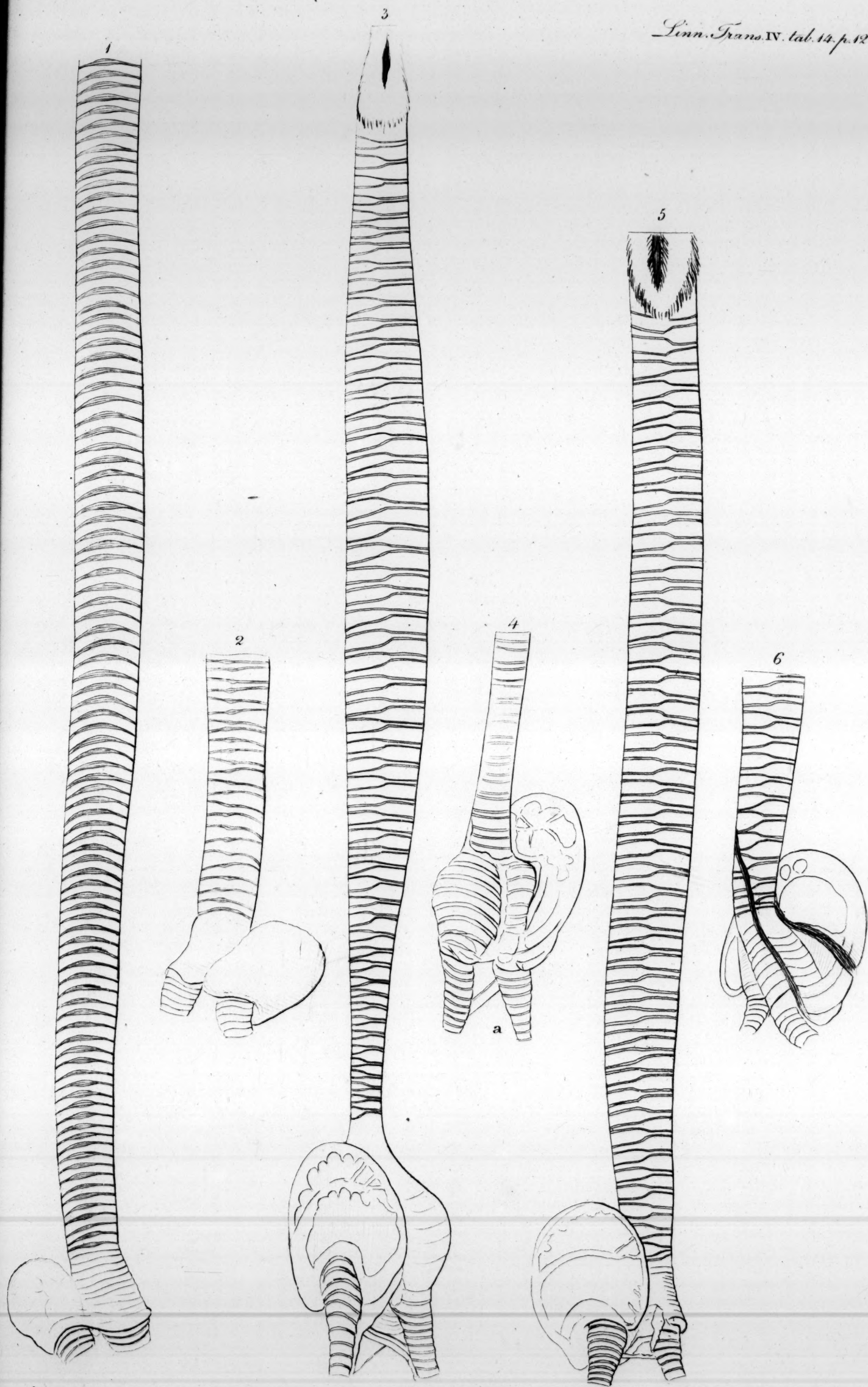




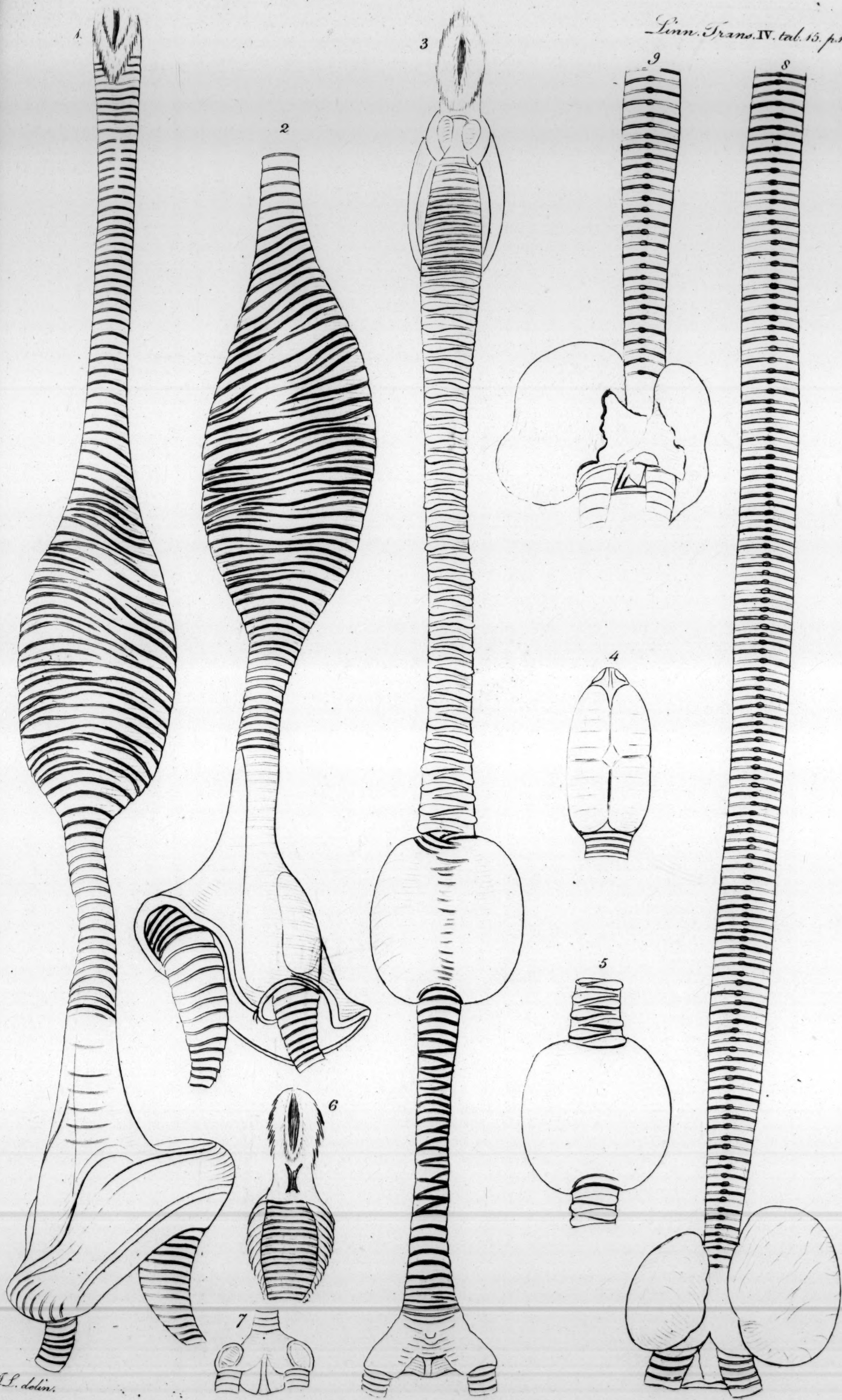




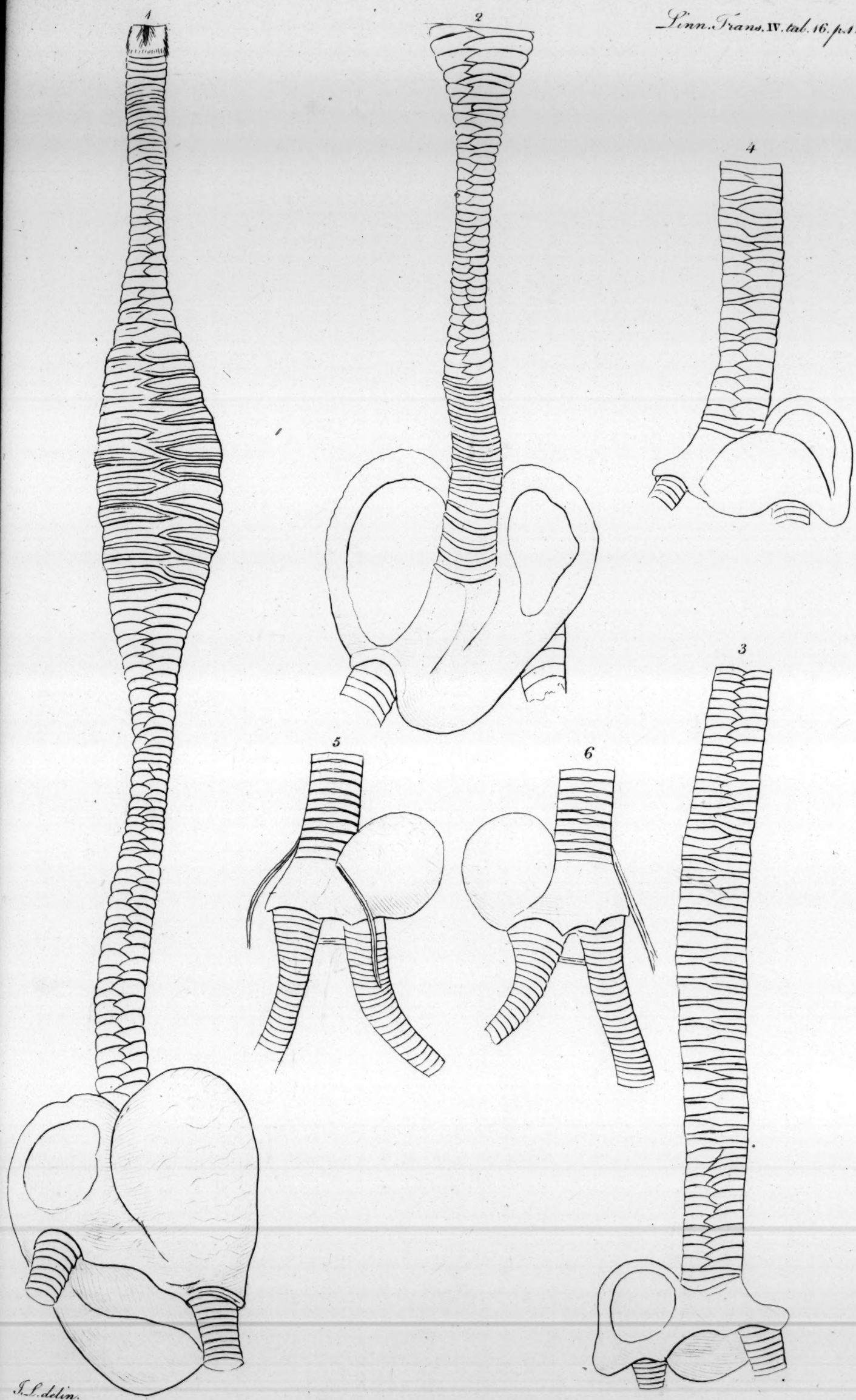














70

IX. *Observations on Bituminous Substances, with a Description of the Varieties of the Elastic Bitumen.* By Charles Hatchett, Esq. F. R. S. Lond. and Edinb. F. L. S. &c.

Read May 2, June 6, and July 4, 1797.

§ 1.

IT is now generally believed that the bituminous substances are not of mineral origin, but that they have been formed from certain principles of substances belonging to the organized kingdoms of Nature, which, after the loss of animal and vegetable life, have suffered considerable changes by long contact and union with mineral bodies.

These changes have been however so considerable, that the bitumens can no longer be referred to their first origin, and they are therefore regarded by general consent as forming part of the present mineral system.

The bituminous substances are :

Naptha,

Petroleum,

Mineral Tar,

Mineral Pitch,

Asphaltum,

Vol. IV.

S

Jet,

Jet,
Pit Coal,
Bituminous Wood,
Turf,
Peat, and

those combinations of the oxides of certain metals with bitumen called Bituminous Ores*.

Those who are acquainted with the nature of these substances will immediately perceive, that they may be formed into two divisions: the first of which consists of simple species, or unadulterated bitumens: and the second is composed of bitumen mixed or combined with the earths, vegetable matter, and metallic oxides; so that these appear to merit the name of compound species.

I shall now first consider how the simple species are connected with each other.

§ 2.

IT has been the opinion of some eminent Naturalists and Chemists, that naphtha is an ethereal oil produced from the more compact and solid bitumens by a sort of natural distillation. This however appears to be an hypothesis founded upon analogy, and supported only by a few local facts which may often be questioned. But many facts and observations concur to prove that the contrary most frequently happens, and that the compact bitumens are often, if not always, formed from naphtha and petroleum by inspissation. I will not however now insist upon the proofs of this, as the varie-

* As I intend only here to notice the modifications of naphtha and petroleum, I have not mentioned amber and the honey-stone.

ties of the elastic bitumen, which I shall soon describe, will be sufficient for the purpose*.

NAPTHA.

NAPTHA is a substance well known to Mineralogists as a light, thin, often colourless oil, highly odoriferous and inflammable, which is sometimes found on the surface of the waters of springs, and at other times issuing from certain strata.

When exposed to the air, it becomes at first yellow, afterwards brown, and in the like proportion it thickens, and passes into

PETROL OR PETROLEUM.

THIS has a greasy feel, is thicker than the preceding substance, is transparent or semitransparent, and of a reddish or blackish brown colour. By air it becomes like tar, and then is called

MOUNTAIN OR MINERAL TAR, BITUMEN PETROLEUM TARDE FLUENS.

THIS substance is viscid, and of a reddish or blackish brown or black. When burned, it emits a disagreeable bituminous smell, and by exposure to the air it passes into

* Bergman was of opinion, that the liquid bitumens were often, if not always, formed from those which are solid, by the means of subterraneous heat; and expresses himself thus: "Cæterum ad fidem pronum est, napham, petroleum, bituminososque liquores, quibus abundat Asia, plures harum materierum exhibens non tantum scaturigines, sed rivulos quoque, quibus etiam, parcius licet distributis, Australis Europa non caret; probabile, inquam, est, has pinguedines liquidas variis antea terris inhæsisse exsiccatas, et mediante calore subterraneo, si non semper, sæpe tamen fluiditatem recuperasse. Novimus ignem in alto haud raro agere, quamvis in superficie vix obscura ejusdem indicia investigare liceat: novimus præterea e sicco aluminari schisto petroleum extorqueri justo caloris gradu, cui arte exponitur.—*Bergman de Productis Vulcaniis Opuscula*, tom. iii. p. 238.

MOUNTAIN OR MINERAL PITCH—BITUMEN MALTHA.

THE mineral pitch much resembles common pitch, and, when heated, emits a strong unpleasant odour, like the former substance. When the weather is cold, it may be broken, and then exhibits, internally, a glassy lustre; but when warm, it is softened, and possesses some tenacity. It is however susceptible of a superior degree of induration, and then becomes

ASPHALTUM—BITUMEN ASPHALTUM—PETROLEUM
INDURATUM.

THIS is a light, brittle substance, of a brownish black, or black. When broken, it shews a conchoidal fracture with a glassy lustre. It has little of the bituminous odour, unless it is rubbed or heated. It easily melts, is very inflammable, and, when pure, burns without leaving any ashes.

In this manner, naptha, by inspissation, passes successively through different states until it becomes asphaltum, which appears to be the ultimate degree of induration which the pure bitumens derived from naptha can receive.

I have at this time specimens before me which prove these gradations; and I have seen a remarkable instance in a bitumen brought from the Island of Trinidad, which exhibits mineral tar passing into mineral pitch, and lastly into asphaltum*.

§ 3.

* The progressive changes of naptha into petroleum, mineral tar, mineral pitch, and asphaltum, appears to be caused by the gradual dissipation of part of the hydrogen of the bitumen, and the consequent development or disengagement of carbon. Hence, I am inclined to believe, arise the changes of colour, the degrees of inspissation, and the increased proportion of carbon found in those substances by chemical analysis.

I would

§ 3.

THE division which comprehends the simple bituminous substances derived from naphtha, may therefore be considered as terminating in asphaltum; but Nature appears to have glided on by an uninterrupted chain which connects the simple bitumens with those which we have called compound; and this effect is produced by the gradual increase of the carbonic principle, and the introduction of extraneous matter, the different quantity of which, together with the greater or less degree of mixture or of chemical union, occasion considerable changes in these substances, so that they are gradually removed from those characters which distinguish the pure bitumens.

To form an accurate table of these gradations, it would be necessary to have comparative analyses of the different bituminous substances, and also to contrast the analyses with the properties of these bodies. But at present these analyses, for the greater part, are wanting; and although at some future time I intend to attempt a series of such experiments, I must now content myself with the observations and facts which I have been able to collect*. From these I am of opinion, that the most immediate gradation from asphaltum (which is the last of the simple bitumens) into those which are compound, takes place in the substance called

I would be understood however to mean that the carbon is only relatively increased, in respect to the other ingredients, in a given quantity of these bitumens, and that it predominates in proportion to the dissipation of a certain portion of the hydrogen, which was originally necessary to the forming of the bitumen in conjunction with the carbon.

* This paper was written and read before I had seen the ingenious experiments which the celebrated Mr. Kirwan has published, in the last edition of his *Elements of Mineralogy*.—Vide vol. ii. p. 514.

JET.

JET.

JET is a substance well known to be of a full black, sometimes however inclining to brown. It is considerably harder and less brittle than asphaltum. It breaks with a conchoidal fracture, and the internal lustre is glassy. It has no odour except when heated, and it then resembles asphaltum. It melts in a strong heat, and, when burned, leaves an earthy residuum.

Wallerius considered jet as asphaltum which had become indurated by time, and Mr. Fourcroy is of the same opinion*. Others again have arranged it with the varieties of coal†. I am inclined however to believe, that it is neither asphaltum nor coal, but an intermediate substance which may be regarded as the first gradation from the simple bitumens into those which are compound. The matter of asphaltum undoubtedly enters into it in a large proportion, and has consequently stamped several of its characters upon it; but the increase of carbon, and of the extraneous or earthy matter which is intimately mixed or rather combined with it, has had so much influence, that the characters of coal are also in some measure apparent, and are rendered the more striking by the similarity of certain local circumstances which attend these two substances. The characters of coal are however by no means fully established in jet, but from this we pass immediately to another, in which these characters cannot be questioned.

This is the substance called

CANDEL COAL,

which is of a full black, of a smooth, solid, even texture; it breaks in any direction, and the transverse fracture is conchoidal. It

* *Elémens d'Hist. Nat. et de Chimie*, tom. iii. p. 456.

† *Widenmann's Handbuch der Mineralogie*, p. 628.

burns well, and is so compact that it is often employed, like jet, to be formed into trinkets.

The great resemblance which cannel coal has to jet in many of its properties, induces me to regard it as the next gradation of the compound bituminous substances, and as the leading variety of coal from which the others follow according to the degree of their bituminous character.

The limits of this paper will not allow me to enter into a circumstantial account of all the other varieties of pit-coal; neither is it necessary, after the gradations of asphaltum to jet, and of jet to coal, have been noticed. I shall not therefore describe the varieties of coal known by divers names in different countries, and even in different provinces, such as those called in England caking coal, rock coal, splent coal, &c. &c.; but shall only observe, that the pit-coals in general appear to be composed of bitumen intimately mixed, or rather combined, with various proportions of carbon and earthy matter; and according to the intimacy of the union, and the excess of one or other of the ingredients, so the compound possesses more or less the characters of perfect coal, or, by various shades, passes into certain earthy or stony substances, which, although impregnated with bitumen, do not merit the appellation of coal, and these also at length gradually lose the bituminous character*.

It is likewise worthy of notice, that the quantity of earthy matter does not appear to be the principal cause why pit-coals do not burn with the rapidity which is to be perceived in some other earthy substances impregnated with bitumen. For we may conclude, that

* From Mr. Kirwan's experiments it appears that carbon is a constituent principle of coal, and that the presence of it is a principal cause of those modifications which produce the species. It even seems chiefly to form the Kilkenny coal.—*Kirwan's Elements of Mineralogy*, vol. ii. p. 521.

the slow combustion of coal proceeds from the joint effects produced partly by the relative proportions of the bituminous, carbonaceous, and earthy ingredients, and partly by the more or less perfect degree of mixture which connects them together, and which degree of mixture, I believe, in many cases, nearly approaches to chemical union, if not actually so: when, therefore, the degree of mixture is so perfect as that every particle of bitumen is connected with much carbon or earthy matter, it is not surprising that the rapid combustible property of the former should be checked in a considerable degree; and, by a parity of reasoning, when the mixture is gross and imperfect, so that it consists of a stony or earthy substance, which has simply imbibed bitumen, it is natural to expect that the bitumen (although less abundant than in coal) should enter readily into combustion, which is vehement in proportion to the shortness of its duration; and this we find to be the case in many earthy substances, and loose sand-stones which are simply impregnated with bitumen.—To return, however, to the varieties of coal, I must observe, that, from the causes above-mentioned, the different characters and properties of coal appear to me to be produced. That in this manner, perfect pit-coal passes into schistose or slaty coal, and this again, by certain gradations, passes into the varieties of combustible or bituminous schistus, which also, by the gradual decrease of the bituminous ingredient, become at length confounded with the varieties of the common or argillaceous schistus.

We have a remarkable example of this in the gradations of bituminous schistus into argillaceous schistus, which are to be observed at Kimmeridge, on the coast of Dorsetshire, where a peculiar bituminous schistus is found, which is used as fuel by the inhabitants, and is improperly called Kimmeridge coal.

By the series of gradations which have been noticed in the foregoing

going pages, the simple bituminous substances appear to pass into those which are compound; and these also, by declining shades, at last pass into substances appertaining to the class of earths and stones.

In the compound bituminous substances the prevalent earthy ingredient is for the greater part generally, if not always, argillaceous; and although certain calcareous grits (such as the Portland stone*) as well as limestones and marbles are found impregnated with bitumen, yet I know not of any instance in which this happens to the degree requisite to form a combustible substance.

This cursory view of the simple bitumens, and of their combinations, would be sufficient as an introduction to the principal subject of this paper; but, to complete the series, I shall make some observations on the vegetable substances which contain bitumen, and shall afterwards mention the mixtures of bitumen with metallic oxides.

§ 4.

WHEN we consider the facts which apparently prove that vegetables have contributed principally to the formation of bitumen, we have every reason to expect that mixtures of vegetable matter with bitumen should frequently occur. But by the mixture of bitumen with the parts of vegetables, we understand the remains and parts of vegetables mixed and connected with the bitumen which they themselves have produced.

This seems to be the nature of the substance called

*The Portland stone, when recently broken in the quarries, emits a strong bituminous odour, like the bituminous limestone or stink-stone. It is also full of extraneous fossils, or at least the vestiges of them.

BITUMINOUS WOOD, as well as of TURF and PEAT.

BITUMINOUS or fossil wood is found in many places ; but in respect to that which is found at Bovey, near Exeter, and which is therefore called Bovey coal, there are some peculiarities which deserve to be mentioned. The Bovey coal is a dark brown, light, brittle substance, which in texture and other external properties much resembles wood which has been half charred. It is not found as scattered logs or trunks, but forms regular strata.

The pits are on a heath which is flat and sandy ; the stratum of sand is however but thin, after which a pale brownish grey clay is found mixed with quartz pebbles. This prevails to about six feet, at which depth the first stratum of the coal commences. The quality of this is however much inferior to that of the subsequent strata, which in all amount to seventeen, producing a depth of nearly seventy-four feet from the surface. Between each stratum of coal is a stratum of clay. The direction of the strata is from east to west, and the inclination or dip is from north to south. The inferior strata are thought to afford the best coal, and the coal is more solid and of a better quality towards the south. The thickest stratum of coal is from six to eight feet *.

The Bovey coal burns readily with a flame like half charred wood : it does not crackle, and, if but moderately burned, forms charcoal ; or if completely burned, it leaves a small quantity of white ashes exactly similar to those of wood. The smell of it when burning also resembles that of wood, with a faint disagreeable odour. It is certainly very remarkable that this substance should form regular strata, although it possesses the texture and most of the

* In the winter, twelve men can raise about 120 tons of this coal in a week, the whole of which is employed in a neighbouring Pottery.

properties of wood; and that these strata do not exhibit any of those irregularities on their surfaces, which might be expected, on the supposition that they were formed by the roots, trunks, and branches of trees long buried in the earth. It is also difficult to imagine wood to have been transported and deposited in this place at seventeen different periods, and yet it must be allowed that these strata have been formed by successive operations. I must confess, that after having twice visited and examined the spot expressly for the purpose, I still find myself utterly unable to offer any opinion upon the subject.

The characters of bitumen are but little apparent in the Bovey coal, and the superior strata even appear to have lost a portion of their combustible principle, while the inferior strata possess it. The lower parts also of these strata are more compact and more combustible than those parts which are immediately upon them*.

Another remarkable sort of fossil wood, which much resembles the Bovey coal, and in like manner is arranged among the bituminous woods, is that found in Iceland, which is called by the inhabitants *Surturbrand*. This is rather harder than the Bovey coal, but in every other respect is the same. It also forms strata many feet in thickness; but it is very extraordinary that these strata appear to be formed of trunks of trees, which, in their transverse

* At about 100 yards to the west of the pits, is a bog of considerable extent, where peat is cut, and decayed roots and trunks of trees are found, which do not, however, in the least approach to the nature of the Bovey coal. Whether this bog has been in any manner connected with the formation of the above-mentioned substance, I do not pretend to determine.

A yellowish brown compact substance, which in colour and fracture resembles ferruginous clay, is also found occasionally with the Bovey coal: it is brittle, and is highly inflammable; it melts like a bitumen, and emits a smoke which in smell resembles amber. This substance is but rarely found.

section, exhibit the concentric circles of their annual growth, with this difference, that the trunks have been so compressed as to be nearly flat, so that the circles appear like parallel lines connected at their extremities by a short curve.

I did not observe such an appearance at Bovey; but this would depend upon the position of the trunks of the trees, in respect to the section of the strata.

Chaptal *, Troil †, Bergman ‡, and many others, have been of opinion that the *surturbrand* is wood which has been charred by the heat of the lava. But I cannot discern why it should be supposed that it has been acted upon by fire, any more than that the Bovey coal has been subjected to the effects of the same agent. The qualities of the two substances are the same; and as (from Archbishop Troil's and Professor Bergman's account) the *surturbrand* is stratified, I think we may venture to pronounce that the circumstances

* *Elements of Chemistry*, vol. iii. p. 199.

† *Von Troil's Letters*, p. 43.

‡ Quid de ligno fossili Islandiæ sentiendum sit, gnaro in loco natali contemplatori decidendum relinquimus. Interea, ut cum Vulcani operationibus nexum credamus, plures suadent rationes, quamvis huc usque modum ignoremus, quo situm texturamque adquisiverunt hæc strata. Scilicet truncis arborum perquam crassis constant, qualis in Islandiâ nullibi reperiuntur, et ne quidem hoc tempore crescere posse videntur. Hi situ horizontali in stratis multorum pedum crassitie congesti sunt et petroleo plus minus penetrati, non jam molli, sed optimè indurato, a quo tam nigrorem, quam flammæ sub deflagratione qualitatem mutantur. Sed quod in primis attentionem meretur, est truncorum in lamellas planas compressio.

Ponamus truncum arboris cujusdam transversum sectum, hinc, uti notum est, figuratur in orbem rediens circiter circularis, quæ omnia monstrat annotina incrementa, extimo propemodum parallela. Fingamus jam talem sectionem in tenuem laminam compressam, et veram habebimus ligni fossilis, de quo heic agitur, ideam; nam in magnis hujus materiæ frustis, transversim sectis, quemlibet annotinorum orbium visu persequi licet, ita plerumque coactum, ut duas lineas fere parallelas exhibeat, quarum extrema

brevi

stances under which they are found, are also similar*. The whole, therefore, of the opinion in favour of fire, appears to rest on the volcanic nature of Iceland; but it surely would be going too far were we to ascribe to fire all the phænomena which are observed in volcanic countries.

Bovey coal, like the furturbrand, resembles half-charred wood; and I will allow, and indeed am disposed to believe, that it is in a state nearly similar; but from this it does not follow that fire has been the cause.

Carbon is known to be one of the grand principles of vegetables, and also as that which is the most fixed, excepting the small portion of the earths contained in them. As a fixed principle, carbon appears to form, in great measure, the vegetable fibre; and after a certain degree of combustion, (by which the other principles have been dissipated,) it remains, and the particles of it keep the same arrangement which they possessed when the vegetable was complete. If, however, the combustion has been carried on with the

brevi flexura sunt adunata.—Quæ autem immanis requiritur vis, ut truncus cylindricus ita complanetur? Nonne antea particularum nexus putredinis quodam gradu fuerit relaxatus? Certe, nisi compages quodammodo mutatur, quodlibet pondus incumbens huic effectui erit impar. Cæterum idem observatur phænomenon in omni schisto argillaceo.

Orthoceratitæ, quæ in strato calcareo conicam figuram perfectè servant, in schisto planum fere triangulare compressione efficiunt. Idem valet de piscibus, conchis, insectisque petrefactis. Causa adhuc latet, sed in utroque casu sine dubio eadem est, et digna quæ exploretur. Observatu quoque dignum est, quod idem reperiatur effectus, quamvis stratum calcareum sub schisto collocatum sit et majori ideo pondere comprimente onustum.—*Bergman de Productis Vulcanis Opuscula*, tom. iii. p. 239.

* "It is found (the furturbrand) in many parts of Iceland, generally in the mountains, in horizontal beds; sometimes more than one is to be met with, as in the mountain of Lack in Bardelstrand, where four strata of furturbrand are found alternately with different kinds of stone."—*Troil's Letters*, p. 42.

free access of air, the carbon enters into combination with oxygen and caloric, and forms carbonic acid.

We have many examples in which carbon is formed or rather liberated from those substances with which it was combined in vegetables; and these are now explained as effects similar to those of combustion, although fire has not been the cause. In both cases the carbon has been freed from the more volatile principles; and under circumstances not favourable to the union of carbon with oxygen, the former must necessarily remain more or less undiminished.

During the combustion of vegetable matter, the more volatile principles contained in the vegetable fibre (which with carbon also form the resinous and other similar substances) appear to be first separated; and in proportion to this separation, the other more fixed substance, which we call carbon, is developed.

Thus, by the progress of combustion, wood becomes brown, and afterwards black; so that the state of the wood shews the degree of combustion to which it has been subjected, or, in other words, how far the separation of the other principles from carbon has been effected.

Combustion is therefore a species of analysis by which the principles of vegetables are separated, according to their affinities, and according to their degree of volatility. By this operation hydrogen and azote (if it be present in the vegetable) are first disengaged and form new combinations, while the carbon is the last which is acted upon; so that unless a sufficient quantity of oxygen be present, it remains fixed and unchanged.

But the same separation of the vegetable principles happens whenever vegetables in the full possession of their juices are exposed to circumstances which favour the putrid fermentation.—As in combustion,

combustion, so by the progress of putrefaction does the vegetable lose its colour, become brown, and afterwards black; at the same time a gas is discharged, which is composed of hydrogen, azote, and carbonic acid.

When combustion is long continued with the free access of air, the whole of the carbon is dissipated in the state of carbonic acid; but in the process of putrefaction a considerable portion of carbon commonly remains even long after the putrid fermentation has ceased. Although, therefore, it is as readily developed by putrefaction as by combustion, it is not, however, when liberated from the other principles, so speedily dissipated by the former as by the latter process.

According to the degree of combustion within certain limits the carbon is more or less apparent, and the like prevails according to the degree of putrefaction; so that whenever the causes which have promoted this species of fermentation have ceased, the vegetable substance will remain with more or less of its first principles, and with more or less visible carbonic matter, according to the degree of putrefaction which has prevailed, and the vegetable substance will consequently have the appearance and properties of wood which has been charred more or less.

To this cause, therefore, I am inclined to attribute the formation and appearance of the Bovey coal and furturbrand; and I believe that the portion of oily and bituminous matter, which I have obtained from them by distillation, is nothing more than the remainder of the vegetable oils and juices which have been partly modified by mineral agents*.

The

* "Coal not only forms the residuum of all vegetable substances that have undergone a slow and smothered combustion, that is, to which the free access of air has been prevented,

The characters of bitumen are much more apparent in turf and peat, than in the greater part of the fossil woods. Turf is well known to be composed of the parts of vegetables, such as small roots, twigs, &c. mixed with a portion of petroleum; and peat is the same, excepting that it generally contains more of earthy matter, or that the vegetables have undergone a more complete decomposition.

The boggy nature of the places in which they are found, proves that a certain degree of maceration is necessary to form the bituminous matter which they contain; and I have already noticed, that every fact appears to demonstrate, that the bitumen is a product of those vegetables, the remains of which constitute the other ingredient of turf and peat.

The different proportion of vegetable matter, of bitumen, and of earth, together with the different state of the bitumen, as well as the degree of perfection respecting the formation of it from the vegetable principles, contribute to alter the properties and characters of the compound, and thus produce varieties. It is believed that these substances have been materially concerned in the formation of pit-coal, and some eminent mineralogists maintain that there is an uninterrupted series which connects the varieties of turf and peat with those of coal*.

§ 6.

vented, but also of all putrid vegetable and animal bodies: hence it is found in vegetable and animal manures that have undergone putrefaction, and is the true basis of their ameliorating powers; if the water that passes through a putrefying dunghill be examined, it will be found of a brown colour, and if subjected to evaporation, the principal part of the residuum will be found to consist of coal. All soils steeped in water communicate the same colour to it in proportion to their fertility; and this water being evaporated, leaves also a coal, as Messrs. Hassenfraz and Fourcroy attest."—*Kirwan on Manures*, p. 154, Vol. v. of *The Transactions of the Royal Irish Academy*.

* Man findet in der natur einen ununterbrochenen übergang von dem rafen und papiertorf

§ 5.

LITTLE need be said concerning those mixtures of bitumen with metals or their oxides which are sometimes called the bituminous ores of mercury, copper and iron, for they should rather be arranged with the adulterated or impure bitumens. Few of them contain the metallic ingredient in a proportion sufficient to cause the compound to be worked as an ore; and the only exception with which I am acquainted, is the substance found at Idria, in Carniola, composed of mercury mixed with bituminous matter, a quintal of which, according to Mr. de Born, affords from fifteen to twenty pounds of mercury*.

§ 6.

FROM the preceding observations it will appear, that although I have first mentioned naptha in order that I might be better understood in respect to the degree of connection prevailing between the bituminous substances, yet, to have followed them from their origin and the period of their formation, I should rather have begun with those substances which most clearly point out how much the vegetable kingdom has contributed to the production of them, with the probable occasional concurrence of animal substances.

That the latter have contributed in some measure to the forming of bitumen, we can only infer from the vestiges and exuviae of animals, which so commonly accompany bituminous substances;

papiertorf durch den moor oder sumpftorf in den pechtorf, und von diesem in die braun schiefer und pechkohle. — *Widenmann*, p. 630.

* *Catalogue de la Collection des Fossiles de Mlle. de Raab*, tom. ii. p. 294, 348, & 400.

but no doubt can be entertained in respect to vegetables, for it appears that bitumen is formed from them by long maceration, and by other processes at present unknown to us :

That when certain portions of vegetable matter remain undecomposed, and are mixed with the petroleum thus produced, the varieties of turf and peat are formed :

That wood in general contributes to the production of bitumen ; but does not seem to retain it, after the formation of it, in so considerable a proportion as the foregoing substances :

That the bituminous matter thus formed, and occasionally separated, is in different states according to the degree of inspissation :

And lastly, with various proportions of carbonic and earthy matter, it forms jet, coal, and bituminous schistus ; and with metallic substances it produces those compounds called bituminous ores.

§ 7.

ABOUT the year 1786 a new species of bitumen was discovered near Castleton, in Derbyshire, which much resembles, in elasticity and colour, the substance known by the name of cahout-chou, or Indian rubber.

Mr. de Born was, I believe, the first who mentioned it* ; but as he appears to have known only one variety of this singular substance, I am induced to hope that a description of many other varieties, which have since been found, will not be unacceptable to this Society.

The elastic bitumen, which resembles the cahout-chou, was first discovered in the cavities of a vein in the lead-mine called Odin, which is near the base of Mamtor, to the north of Castleton. The

* *Catalogue de la Collection de Mlle. de Raab, tom. ii. p. 77.*

ore of this mine (which is supposed to be one of the most ancient in England) is galena, accompanied by fluor, calcareous and heavy spars, quartz, blende, calamine, felenite, asphaltum, and the elastic bitumen, although the latter is now rarely found*. Another species of the elastic bitumen has within about three years been found in a neighbouring rivulet; but I shall not at present notice it, as I intend first to describe the varieties of that which was first discovered, and which resembles the cahout-chou. In order to do this with more perspicuity, I shall describe the specimens belonging to my collection, according to the mode in which I have arranged them.

SPECIES THE FIRST.

A, No. 1.

ELASTIC bitumen of a yellowish brown colour, part of which is almost liquid like petroleum, and adheres to the fingers; the other part is of a darker colour, of a mammillary form, does not adhere to the fingers, and is soft and elastic. This is on a grey bituminous limestone, with white calcareous spar in the figure of hexaedral pyramids, forming that which is called the dog-tooth spar.

A, No. 2.

Bitumen of a yellowish brown, partly liquid, and partly elastic, which, however, adheres to the fingers; on pale grey limestone, with crystals of white fluor spar, blende, and galena.—On another part of the limestone are some globules of bitumen of a reddish brown, perfectly hard and brittle.

* I am indebted to the ingenious Mr. White Watson, of Bakewell, for much information respecting the local circumstances which attend this bitumen.

A, No. 3.

Dark brown bitumen of a stalactitical form, hard, but in some degree elastic.

A, No. 4.

Bitumen of a reddish brown, in the form of globules, some of which are elastic, and others hard: on brownish-grey limestone, accompanied by crystallized white fluor, dogtooth calcareous spar, and pyrites in small crystals, some of which are on the surface of the globules of bitumen.

A, No. 5.

The same of a darker brown, of a stalactitical form, hard and brittle; on pale brown calcareous spar, impregnated with bitumen.

A, No. 6.

Bitumen of a dark reddish brown, very hard; on pale brown sparry stink-stone, with grey limestone, in which are some coralloides.

A, No. 7.

Bitumen of a dark yellowish brown, elastic, but very soft, so that it adheres to the fingers.

A, No. 8.

The same thinly spread over grey sparry stink-stone.

A, No. 9.

Bitumen of a brownish olive colour, which becomes reddish brown by the air, but when opposed to the light it appears semi-transparent,

transparent, and of a yellowish brown inclining to orange. It is soft, very elastic, and (when recently cut) adheres to the fingers.

A, No. 10.

The same of a darker brown, and harder in a small degree. The specific gravity of this specimen is 0,9053; water being estimated at 10,000 at temp. 60°.

A, No. 11.

Bitumen of a dark brown, harder than the former. This exactly resembles the cahout-chou in the degree of elasticity, and in the property which it possesses of removing the traces of black-lead.

A, No. 12.

The same, but rather harder.

A, No. 13.

The same of a blackish brown, which is slightly elastic when the weather is warm, but is brittle when cold.

A, No. 14.

The same of a blackish brown, nearly black, which scarcely possesses any elasticity; it breaks, and resembles asphaltum in lustre, colour and fracture.

A, No. 15.

The same of a reddish brown, perfectly hard and brittle. The characters of asphaltum are complete in this specimen.

The specific gravity is 10,233.

The other species of elastic bitumen, which I shall distinguish by
the

the letter B, has been found during the last three years in a rivulet which runs at the base of Mamtor, from West to East, at a small distance from Odin mine.—The varieties of it, in my possession, are as follow:—

SPECIES THE SECOND.

B, No. 1.

ELASTIC bitumen, which, recently cut, exactly resembles fine close cork in colour and texture, but, by the air, in a few days it becomes of a pale reddish brown.—This forms a thin coat, which completely covers a mass of elastic bitumen, which is soft, and of a brownish olive colour, like A, No. 9.

B, No. 2.

The same, excepting that the coat or crust is much thicker.

B, No. 3.

The same, but the coating is thicker than that of No. 2, and the brownish olive-coloured bitumen much less in quantity.

B, No. 4.

The same, excepting that the greater part of the mass resembles cork, so that only a very small nucleus of the brown bitumen remains*.

B, No. 5.

The same, excepting that the bitumen, which is coated, is in the state of asphaltum.

The specific gravity of this specimen is 0,9881.

* One of the specimens in my possession, similar to B, No. 4. weighs between 13 and 14 pounds.

B, No. 6.

Elastic bitumen, the whole mass of which resembles fine cork.—
The specific gravity is 0,9748.

B, No. 7.

The same, but friable, and apparently passing by decomposition into an ochraceous coloured powder.

THE varieties of the first species of the elastic bitumen, or that which is like the cahout-chou, evidently appear to be formed from a naptha or petroleum, which, like that which produces the other simple bituminous substances formerly mentioned, is susceptible of various degrees of inspissation.

All the varieties of the first species, from No. 1, to No. 15, may be regarded as thus formed, for in these we can trace all the modifications comprehended between petroleum and asphaltum; with this difference, that the intermediate modifications of this species have the remarkable property of elasticity, which is the most complete in the variety which occupies the middle place between petroleum and asphaltum.

The second species B, or that which resembles cork, appears so different from that marked A, that it is not at first easy to conceive how they are connected, or at least the difficulty must appear great to those who have only seen specimens of each species complete in their respective characters. But, from an attentive examination of many specimens, and particularly of those which I have described, I am convinced that the varieties of the species B are only modifications of the species A, produced probably by long maceration in the water of the rivulet in which this species is found, to the effects of which we may, with some appearance of reason, add the vicissitudes

vicissitudes of the seasons, of air, and of the weather in general, as well as those of reiterated moisture and dryness occasioned by the rise and fall of the water of the rivulet; and what seems to corroborate this opinion is, that the substance, like cork, incrusts the species A, and appears to be only a change which has penetrated deeper into the substance of it in proportion to the duration of the causes which I have mentioned, so that at length the original substance no longer remains in its primitive state. I do not believe, however, that this change arises from any alteration in the constituent principles, but merely from a partial and minute disunion or disintegration of the particles of the original substance, as both species melt into one which is perfectly similar. I must also add, that the species A burns easily, and with rapidity; but the species B burns with some difficulty, and crackles as if it had imbibed a quantity of water.

I have remarked, when the different varieties of the elastic bitumen were melted, that they completely lost the elastic property, and a quantity of air or gas appeared to be disengaged, particularly from the species B. I also observed, that the substances which remained after this operation, corresponded, in respect to consistence, with those which had been employed, as the following Table will shew:—

- | | |
|---------------------|--|
| A, No. 7 and 8. ... | produced a thick liquid petroleum, not apparently different from that which is commonly known. |
| A, No. 9. | produced a thicker petroleum, approaching to mineral tar. |
| A, No. 11 and 12. | produced mineral tar. |
| B, No. 6. | produced the same, approaching to mineral pitch. |
| A, No. 13. | produced mineral pitch. |
| A, No. 14 and 15. | did not suffer any change, but remained as at first, with all the characters of asphaltum. |

From what I have related, I suspect that the elastic property is occasioned by the interposition of very minute portions of air or some other elastic fluid between the parts of the bitumen, and that this takes place by reason of some unknown cause at the time of formation; but when these bitumens are melted, the elastic fluid is liberated, and the mass loses that fine spongy texture which I suspect to have been the cause of the elastic property*.

Derbyshire is well known as a country which exhibits, in the most striking manner, the remarkable changes which our globe has suffered. In every part of it, the most indisputable evidences appear of some great and extraordinary revolution; and there is not any place where extraneous fossils, such as the remains and impressions of vegetables and animals, are more abundant.

Bitumen, in other countries, is most commonly found where these present themselves; and, in like manner, there are few countries which abound so much with bitumen as Derbyshire.

Whoever has examined the limestone rocks about Matlock, and most other places in this county, must be convinced of the truth of this assertion.

The limestone and calcareous spars also, where the elastic bitumen is found, are, for the greater part, in the same state; so that no doubt can be entertained but that this bitumen has had the same origin as those which are more generally known; and it would

* The elastic bitumen, A, No. 9. when digested in sulphuric ether in a temperature of about 55°, is partly dissolved. The solution is yellowish brown when opposed to the light; but when otherwise viewed, is like the bitumen, that is, of a brownish olive colour. By spontaneous evaporation, the etheric solution leaves a yellowish brown bitumen, which is totally devoid of elasticity. The undissolved portion (like the cahout-chou under similar circumstances) is softened, and is much increased in bulk.

The species B, No. 6. cut into very thin slices, communicates a yellow tinge to sulphuric ether; in other respects it is but little affected.

undoubtedly have been confounded with them, had it not been discovered when passing from the liquid to the solid state.

The elementary principles of bitumen are, hydrogen, carbon, sometimes azote, and probably some oxygen, which, by its action on the other principles, tends to form the concrete bitumens, and also produces that portion of acid obtained by chemical operations. These same principles, hydrogen and carbon, constitute the vegetable oils and resins; and the same, with some azote, form the oils and grease of animals. Now it is known that very small changes in the respective proportions of these ingredients, and in the circumstances which attend the combination of them, will cause considerable variations in the nature of the products; and in like manner, it appears very probable, that when the organized bodies in their recent state, and in the full possession of the above-mentioned principles, have been buried in a situation where these principles have been long elaborated under certain favourable circumstances, and subjected to the action of mineral bodies; I say that it appears highly probable, that a new combination, which we call bitumen, may be formed, which, although different in some respects from the vegetable and animal products, still, however, retains many characters of those substances from the principles of which it has been formed.

HAMMERSMITH,

April 26, 1797.

X. *Ans*

X. *An Account of the Jumping Mouse of Canada. Dipus Canadensis.*
By Major General Thomas Davies, F. R. S. and L. S.

Read June 6, 1797.

AS I conceive there are very few persons, however conversant with Natural History, who may have seen or known there was an animal existing in the coldest parts of Canada, of the same genus with the Jerboa, hitherto confined to the warmer climates of Europe and Africa; I take the liberty of laying before this Society the following observations (accompanied by a drawing) on an animal of that kind, procured by myself in the neighbourhood of Quebec, during my last residence in that country. As I do not recollect to have seen this animal either figured or described by any author in Natural History, I flatter myself, these observations may afford some satisfaction to the President and Members of the Linnæan Society. The specimens from which I made the drawing are now in my collection. With respect to the food, or mode of feeding of this animal, I have it not in my power to speak with any degree of certainty, as I could by no means procure any kind of sustenance that I could induce it to eat; therefore, when caught, it only lived a day and a half. The first I was so fortunate to catch was taken in a large field near the Falls of Montmorenci, and by its

having strayed too far from the skirts of the wood, allowed myself, with the assistance of three other gentlemen, to surround it, and after an hour's hard chase to get it unhurt, though not before it was thoroughly fatigued, which might in a great measure accelerate its death. During the time the animal remained in its usual vigour, its agility was incredible for so small a creature. It always took progressive leaps of from three to four, and sometimes of five yards, although seldom above 12 or 14 inches from the surface of the grass; but I have frequently observed others in shrubby places and in the woods, amongst plants, where they chiefly reside, leap considerably higher. When found in such places, it is impossible to take them, from their wonderful agility, and their evading all pursuit by bounding into the thickest cover they can find.

With respect to the figure given of it in its dormant state, I have to observe, that specimen was found by some workmen, in digging the foundation for a summer-house, in a gentleman's garden about two miles from Quebec, in the latter end of May 1787. It was discovered enclosed in a ball of clay, about the size of a cricket-ball, nearly an inch in thickness, perfectly smooth within, and about 20 inches under ground. The man who first discovered it, not knowing what it was, struck the ball with his spade, by which means it was broken to pieces, or the ball also would have been presented to me. The drawing will perfectly shew how the animal is laid during its dormant state. How long it had been under ground it is impossible to say; but as I never could observe these animals in any parts of the country after the beginning of September, I conceive they lay themselves up some time in that month, or beginning of October, when the frost becomes sharp; nor did I ever see them again before the last week in May, or beginning of June. From their being enveloped in balls of clay, without any
appear-

appearance of food, I conceive they sleep during the winter, and remain for that term without sustenance. As soon as I conveyed this specimen to my house, I deposited it, as it was, in a small chip-box, in some cotton, waiting with great anxiety for its waking; but that not taking place at the season they generally appear, I kept it until I found it begin to smell: I then stuffed it, and preserved it in its torpid position. I am led to believe its not recovering from that state arose from the heat of my room during the time it was in the box, a fire having been constantly burning in the stove, and which in all probability was too great for respiration. I am led to this conception from my experience of the Snow Bird of that country, which always expires in a few days (after being caught, although it feeds perfectly well) if exposed to the heat of a room with a fire or stove; but being nourished with snow, and kept in a cold room or passage, will live to the middle of summer.

The animal above described belongs to Schreber's genus of *Dipus*, and may be characterised

DIPUS CANADENSIS,

palms tetradaetylis, plantis pentadaetylis, caudâ annulatâ undique setosâ corpore longiore.

Tab. viii. Fig. 5. represents the *Dipus canadensis*, of its natural size, in an erect position.

Fig. 6. shews it in a torpid state.

XI. *Observations on the Flowering of certain Plants. By the Rev. Thomas Martyn, B.D. F.R.S. V.P.L.S. Regius Professor of Botany in the University of Cambridge.*

Read July 4, 1797.

THE improvements in the physiology of plants, since the days of Malpighi and Grew, have by no means kept pace with those which have been made in the nomenclature, and in the ascertaining of genera and species by accurate characters, descriptions and figures, under Linnæus and his followers. The reason is obvious: in order to ascertain a plant, it is only necessary to see and describe it once or twice in its state of greatest perfection; but we are not likely to become acquainted with the internal structure and functions of vegetables, till a series of accurate experiments shall have been gone through; or with their life, actions and manners, if we may so speak, till we have got together a fund of laborious researches and observations. And there are very few persons who can sacrifice all the numerous calls of business or pleasure, to bestow a constant and regular attention to one object, and to become almost as stationary as the plants they are observing. Even the following observations, which are almost too trifling to offer for the consideration of the Linnæan Society, required a regular attention several repeated times morning and evening during upwards of six weeks.

The

The three plants (*Anagallis arvensis*, *Oenothera biennis*, *Hibiscus trionum*) which were selected for these observations, were taken rather for the convenience of their situation, from their vicinity to the house, than for any other reason. *Anagallis arvensis*, however, is a delicate wild plant, that has long since attracted notice, as indicating rainy weather or a moist atmosphere by the closing of its flowers, and the contrary by their opening. Hence its name among the country people, of *Shepherd's* or *Poor man's weather-glass*. And *Oenothera biennis* has been generally regarded, from an early period, for the regular opening of its flowers in the evening, and has thence obtained the name of *Evening* or *Nightly Primrose*.

The flowers of the *Oenothera* are collected in a very close corymbus at the top of the stalk till the time of flowering. The upper flowers expand first; and as they expand successively, the stalk is advancing in height, and separating the flowers; insomuch that when the flowering time is past, there is the space of a foot or eighteen inches interposed between those flowers which were originally contiguous. Whilst each flower is preparing for expansion, the peduncle gradually diverges from the stem, and, before the flower opens, arches downwards like a swan's neck: the corolla swells out at bottom, and is very apparent there between the leaflets of the calyx, which keep it close together for a considerable time at top, by means of the hooks at the extremity of the calycine leaflets, till at length the corolla bursts its bonds instantaneously, opens to a certain point, and then having made a stand for a few seconds, expands very slowly to its full extent. This critical moment is very interesting to the botanical observer, and may be seen with ease and pleasure between six and seven within the house, by gathering the flowers and setting them in water. In hot weather the flowers
grow

grow flaccid, and wither before noon the next day; but in cool and cloudy weather they will last two days.

The flowers of *Hibiscus trionum*, when once expanded, continue open till they close finally. They then droop; and when the corolla is withered and fallen, the peduncle again becomes erect. In warm weather the corolla folds up wholly at night, and decays on the second day; but in cool weather it will last a day or two half folded up, but never opening so as to show the rich purple eye at its base.

The height of the barometer and thermometer, with the state of the weather on each day, are given with a view of ascertaining whether there be any connection between them and the time in which the flowers open.

The barometer was observed between 8 and 9 A. M. and the thermometer at the same time, and again about 3 P. M. The latter instrument was within the house, but in a hall, the door of which was commonly open, and not at all exposed to the sun.

Observations on the Opening and Closing of the Flowers of Anagallis arvensis, Oenothera biennis, Hibiscus trionum, &c. during the Autumn of 1796.

	Barom.	Therm.	Weather.	Observations.
Aug. 16.	29 $\frac{2}{10}$	66°	Dry, sunshine and clouds alternately. Wind N. E.	Hibiscus trionum open from 8 to 4.
17.	29 $\frac{2}{10}$	61 to 64	The same, only more cloudy.	Hibiscus trionum open from 8 to 4.
18.	29 $\frac{2}{10}$	61 to 64	The same, morning covered.	Hibiscus trionum open from 10 to 4.
19.	29 $\frac{7}{10}$	62 to 66	The same, but warmer.	Hibiscus trionum open from 9 to 4.
20.	29 $\frac{7}{10}$	62 to 68	Fog, soon cleared, hot.	Hibiscus trionum open from 9 to 4.
21.	29 $\frac{6}{10}$	64 to 70	Clear, hot. Wind E.	Hibiscus trionum open from 8 to 4.
22.	29 $\frac{13}{10}$	64 to 71	The same.	Hibiscus trionum open from 8 to 4.

	Barom.	Therm.	Weather.	Observations.
Aug. 23.	29 $\frac{7}{10}$	65 to 71	Clear, hot. Wind E.	Anagallis arvensis open from 9 to 3. Apargia hispida closed at 12. Hibiscus trionum 8 to 4. Anagallis arvensis 10 to 3. Apargia hispida 8 to 12. Hibiscus 8 to 3.
24.	29 $\frac{7}{10}$	63 to 70	The same.	Anagallis 10 to 3. Oenotherabiennis open at 7 p.m. Bellis perennis shut at 7 p. m. Hibiscus 8 to 2 $\frac{1}{2}$.
25.	29 $\frac{6}{10}$	63 to 68	Fog, cleared before 10. Wind S. W.	Anagallis 10 to 2. Oenothera 7 p. m. open. Bellis 7 p. m. shut. Hibiscus 8 to 4.
26.	29 $\frac{7}{10}$	65 to 69	Light clouds and airs. Wind S. W. Great clouds at noon, announcing a distant storm. Flowers not affected by it. Afternoon very cloudy, with a sprinkling of rain. Heavy rain and wind at night.	
27.	29 $\frac{9}{10}$	63 to 71	Wind N. N. W. Cloudy with sunshine. Windy afternoon. A shower at 2 P. M.	Anagallis 9 $\frac{1}{2}$ to 2. Oenothera 6 p. m. open. One flower of Hibiscus not shut at 6 p. m.
28.	29 $\frac{6}{10}$	61 to 63	Windy, clear morn, N. W. Cloudy at 10. Very cloudy the rest of the day, Wind N. Evening clear.	Hibiscus 9 $\frac{1}{2}$ to 4. Anagallis half open at 12, quite open at 1, closed before 2. Oenothera 7 p. m. open
29.	29 $\frac{11}{10}$	60 to 62	Wind N. Light clouds and flying showers. N. E.	Hibiscus open 9 to 5. Anagallis 8 to 3. Oenothera 7 p. m. open. Some flowers of Hibiscus not finally closed at 7.
30.	29 $\frac{6}{10}$	61 to 62	Wind N. E. Cloudy, windy. Rain at 2. Afternoon and evening wet.	Hibiscus 9 $\frac{1}{2}$ to 4. but never fully opened. Anagallis not open. Oenothera 7 p. m. open. Flowers of the 27th only flaccid; of yesterday contracted, but not flaccid.
31.	29 $\frac{6}{10}$	60 to 61	Wind E. covered. Windy with some wet.	Hibiscus 9 to 4. Anagallis 11 to 1, but never perfectly expanded. Oenothera 6 $\frac{1}{2}$ open. Flowers of the 28th not withered till 9 a. m. this day.
Sept. 1.	29 $\frac{5}{10}$	60 to 62	Wind N. W. Clear with some flying clouds and wind. More cloudy towards afternoon.	Hibiscus and Anagallis not open. Oenothera 6 $\frac{1}{2}$ open.
2.	29 $\frac{5}{10}$	59 to 62	Sunshine, with white clouds, Wind E. N. E. Dry all day.	Hibiscus 9 $\frac{1}{2}$ to 4. Anagallis 12 to 2. Oenothera 7 p. m. open.

	Barom.	Therm.	Weather.	Observations.
Sept. 3.	29 $\frac{5}{8}$	59 to 63	Sunshine, with white clouds, Wind N. W. Fine weather with much sun till evening; then very cloudy. Gentle rain in the evening.	Hibiscus 9 to 4 $\frac{1}{2}$. Anagallis only half open at noon. Oenothera 6 p. m. open. Hibiscus 9 $\frac{1}{2}$ to 5. Anagallis 11 to 3. Oenothera 7 p. m. open.
4.	29 $\frac{5}{8}$	60 to 62	Gentle rain in the morning. Wind W. N. W. Cloudy all day and warm.	Hibiscus 9 $\frac{1}{2}$ to 5 $\frac{1}{2}$. Anagallis half open at noon for a little time. Oenothera 6 $\frac{1}{2}$ p. m.
5.	29 $\frac{11}{8}$	60 to 62	Wind W. Covered, with heavy clouds. Sun appeared about 1, and the afternoon continued fair.	Hibiscus 10 $\frac{1}{2}$ to 6 $\frac{1}{2}$, but never fully open. Anagallis 11 to 2, but not quite open. Oenothera 7 p. m.
6.	29 $\frac{5}{8}$	60 to 63	Wind W. Covered, windy. Afternoon very cloudy, with strong wind.	Hibiscus 9 $\frac{1}{2}$ to 4 $\frac{1}{2}$. Anagallis 10 to 2 $\frac{1}{2}$. Oenothera 7 p. m.
7.	29 $\frac{7}{8}$	61 to 63	Wind W. Heavy rain in the morning; afterwards fair; evening very clear.	Hibiscus 12 to 6. Anagallis 1 $\frac{1}{2}$ to 3. Oenothera 7 p. m.
8.	29 $\frac{5}{8}$	59 to 71	Clear sunshine. Wind W.	Hibiscus 9 $\frac{1}{2}$ to 6. Anagallis 10 to 3. Oenothera 6 p. m.
9.	29 $\frac{6}{8}$	62 to 66	Covered, but sun appears before 10. Wind W. Clouds.	Hibiscus 8 $\frac{1}{2}$ to 5. Anagallis 10 to 3. Oenothera 6 p. m.
10.	29 $\frac{11}{8}$	62 to 68	Morning clear sunshine. Wind S. W. Cloudy. Evening covered.	Hibiscus 8 $\frac{1}{2}$ to 4 $\frac{1}{2}$. Anagallis 9 $\frac{1}{4}$ to 3. Oenothera 6 $\frac{1}{2}$ p. m.
11.	29 $\frac{11}{8}$	65 to 67	Wind S. W. Covered. A shower. Clear at noon and the whole day after.	Hibiscus 8 $\frac{1}{2}$ to 5 $\frac{1}{2}$. Anagallis at 10 $\frac{1}{2}$ half open, Quite open from 12 to 3. Oenothera 6 $\frac{1}{2}$ p. m.
12.	29 $\frac{7}{8}$	63 to 67	Wind W. S. W. White clouds. Heavy clouds at noon. Fair all day.	Hibiscus 8 $\frac{1}{2}$ to 5. Anagallis 9 $\frac{1}{2}$ to 2 $\frac{1}{2}$. Oenothera 6 $\frac{1}{2}$ p. m.
13.	29 $\frac{7}{8}$	61 to 68	Wind S. W. Strong dew. Morning clear; cloudy before 10. White clouds all day.	Hibiscus 8 $\frac{1}{2}$ to 5 $\frac{1}{2}$. Anagallis 10 to 2 $\frac{1}{2}$. Oenothera 6 $\frac{1}{2}$ p. m.
14.	29 $\frac{6}{8}$	63 to 69	Wind W. S. W. Heavy clouds and sunshine.	Hibiscus 8 to 4 $\frac{1}{2}$. Anagallis 9 $\frac{1}{2}$ to 2 $\frac{1}{2}$. Oenothera 6 $\frac{1}{4}$ p. m.
15.	29 $\frac{5}{8}$	65 to 68	Wind W. S. W. Heavy clouds and wind. Fair all day.	Hibiscus 8 $\frac{1}{4}$ to 4. Anagallis 9 $\frac{3}{4}$ to 2 $\frac{3}{4}$. Oenothera 6 $\frac{3}{4}$ p. m.
16.	29 $\frac{6}{8}$	66 to 68	Wind W. S. W. Covered. Heavy clouds with some wind. Fair all day.	Hibiscus 8 to 5. Anagallis 9 to 2. Oenothera past 7.
17.	29 $\frac{11}{8}$	64 to 73	Wind W. S. W. Clouds with sunshine and wind.	Hibiscus 8 $\frac{1}{2}$ to 4 $\frac{1}{2}$. Anagallis 9 $\frac{1}{2}$ to 2 $\frac{3}{4}$. Oenothera 6 $\frac{3}{4}$ p. m.

Sept.

	<i>Barom.</i>	<i>Therm.</i>	<i>Weather.</i>	<i>Observations.</i>
Sept. 18.	29 $\frac{5}{10}$	66 to 68	Wind S. W. Covered. Still. Small showers.	Hibiscus 8 $\frac{1}{2}$. Anagallis 10 to 1 $\frac{3}{4}$. Oenothera past 7.
19.	29 $\frac{4}{10}$	63 to 66	Wind E. Covered. Gentle rain in the morning. Very moist all day.	Hibiscus and Anagallis not open. Oenothera past 7.
20.	29 $\frac{2}{10}$	64 to 66	Wind S. S. W. Heavy clouds. Rain at 4.	Hibiscus 9 to 5. only half open. Anagallis 12 to 2 $\frac{1}{2}$, half open. Oenothera 6 p. m.
21.	29 $\frac{1}{10}$	64 to 67	Heavy rain. Clearer at $\frac{1}{2}$ af. 10. Wind W. S. W. Sunshine, with heavy white clouds.	Hibiscus 12 $\frac{1}{2}$ to 6. Anagallis 1 to 2 $\frac{1}{2}$ but never quite open. Oenothera 6 $\frac{1}{2}$.
22.	29 $\frac{3}{10}$	62 to 63	Strong dew. Still E. N. E. Heavy clouds with sunshine. Covered at noon.	Hibiscus 10 to 5, half open. Anagallis 10 $\frac{1}{2}$ to 1 $\frac{1}{2}$, half open. Oenothera after 7.
23.	29 $\frac{4}{10}$	60 to 63	Wind E. Covered.	Hibiscus and Anagallis not open. Oenothera after 7.
24.	29 $\frac{4}{10}$	59 to 61	Wind E. Covered. Still.	Hibiscus and Anagallis scarcely open. Oenothera after 7.
25.	29 $\frac{4}{10}$	59 to 61	Wind E. Covered. Windy. Some rain in the evening.	Hibiscus scarcely open. Anagallis not open. Oenothera 6 p. m.
26.	29 $\frac{4}{10}$	59 to 61	Wind N. E. Windy with rain.	Hibiscus and Anagallis not open. Oenothera after 7.
27.	29 $\frac{6}{10}$	59 to 61	Wind E. Windy. Light clouds with sunshine. Covered at noon.	Hibiscus scarcely open. Anagallis at 11, half open.
28.	29 $\frac{13}{10}$	58 to 59	Wind E. Covered.	Nothing open.
29.	29 $\frac{7}{10}$	57 to 59	Wind N. E. Strong dew. Morning clear, but covered before noon.	Hibiscus not open. Anagallis half open at 11.
30.	29 $\frac{8}{10}$	56 to 59	Wind N. E. Morning clear, af- terwards great white clouds.	Hibiscus 12 half open. Anagallis 11 to 3 quite open.
Oct. 1.	29 $\frac{13}{10}$	55 to 56	Wind N. W. Covered. Sun broke out at noon.	Hibiscus not open. Anagallis 11 $\frac{1}{2}$ to near 2.

After this to the 13th the barometer sunk to $\frac{3}{10}$ and $\frac{1}{10}$. The thermometer varied from 50 to 58. The wind was chiefly W. to W. N. W. The weather was mostly covered and windy. And the flowers did not open.

XII. *Remarks on some Foreign Species of Orobanche.* By James Edward Smith, M. D. F. R. S. P. L. S.

Read October 3d, 1797.

THE British species of *Orobanche* have till lately been very ill understood, and it appears upon examination that the foreign ones still require elucidation. The very first species in Linnæus, *Orobanche lævis*, when put to the test of botanical criticism, is found to be a non-entity; its history having been fabricated, partly from synonyms which belong to *Orchis abortiva*, and partly from those of a real *Orobanche*, which however Linnæus never knew, and which does not answer to the name or character of his supposed *lævis*.

The original authority for the *Orobanche lævis* is the first edition of *Species Plantarum*, p. 632, where it is taken up entirely from other authors, who have described it as being found near Montpellier, of which place Linnæus accordingly gives it as a native, nor does he mention its being known in any other country. He had no specimen from thence in his collection, though he had then before him a specimen of a Siberian plant, figured in the *Flora Sibirica* of Gmelin, (who sent it to Linnæus,) vol. iii. tab. 46. fig. 2, as an *Orobanche*, which Linnæus suspected might be the same with the Montpellier species, and therefore marked it *lævis*, with a mark of interrogation, as it still remains in his herbarium. It answers indeed

deed to the specific definition of *lævis*, *caule simplicissimo lævi*, *staminibus exsertis*; but there is no reason to believe that definition was made from the contemplation of this specimen, rather than from the synonyms and figures quoted in the *Species Plantarum*: and as Linnaeus never farther described the specimen, nor referred to Gmelin, neither did he ever mention Siberia as the native country of his *Orobanche lævis*, this can never be taken for such, even though there should prove to be no other existing, as we now hope to demonstrate; more especially as this Siberian specimen proves a *Lathræa*, having a monophyllous quadrifid calyx, and the true habit of that genus.

In order clearly to understand the history of this mistaken species, the *Orobanche lævis*, it is necessary to analyze its synonyms chronologically. We begin therefore with

OROBANCHE magna purpurea monspessulana. *Bauhin's Hist. Plant.*
vol. ii. p. 782.

This plant is evidently taken up by John Bauhin from Lobel, in whose *Icones*, p. 269, we find two figures. The first represents, I think unquestionably, though rudely, the *Orchis abortiva* of Linnaeus, and is marked *Orobanche major e Gramuntio luco Monspelliensium*. The second exhibits a true *Orobanche*, and is marked *Orobanche quarta*. Now it appears that the description of John Bauhin belongs to the first of these plants, though he, or his editor, has by mistake annexed to that description a copy of the second figure. Whether the description be taken from any of Lobel's other publications, I have not been able to determine, nor is that point of any consequence; it is sufficient that it agrees altogether with the *Orchis* above mentioned, and not with any *Orobanche*, the flowers being described "like those of an *Orchis* with short spurs, and the root like the upper part of that of an *Orchis*, but without any *testiculi* or bulbs."

Bauhin

Bauhin justly censures Lobel's figure, as wanting the spurs; he also enquires whether this plant may not be what Clusius mentions in his *Historia*, as "a plant like his *Pseudo-leimodorum*, but much paler, found in the wood of Gramont, and several other woods about Montpellier." There can be no doubt of the *Pseudo-leimodorum* of Clusius, *Hist. Plant.* 270, being the *Orchis abortiva*, though a figure of *Ophrys Nidus Avis*, by an error common in books with wooden cuts, is put for it*. The description in that work is indeed copied from his *Stirpes Pannonicæ*, where the plant is named *Limodorum austriacum*, without any figure; and the paler variety, which he remembered to have seen formerly near Montpellier, is also there mentioned. I consider therefore the descriptions of John Bauhin and Clusius, and the first or left-hand figure of Lobel's *Icones*, p. 269, as clearly belonging to *Orchis abortiva*, and having nothing to do with any *Orobanche*. With respect to the second or right-hand figure of Lobel, copied into Bauhin's work by mistake, it as indubitably, I think, represents the *Orobanche* lately published in *Tab.* 423 of *English Botany*, by the name of *cærulea*, which several authors there mentioned have taken for the Linnæan *lævis*: it cannot however remain, when the above errors are cleared away, as the true *lævis*, because it is not in fact smooth, neither do the stamina project out of the flower; though Morison, in his copy of this figure, *scët.* 12. *t.* 16. *f.* 2, has in one flower so represented them; for the compiling and copying tribe of authors are sure to add something every now and then to the general stock of error, how little soever they may supply to that of solid knowledge. The style indeed projects in Lobel's figure, and all its copies; the stem too is represented smooth, and the form of the corolla is very ill expressed: yet these figures can be designed for nothing else than our *O. cærulea*.

* Villars points out this error in his *Plantes de Dauphiné*, vol. ii. p. 40.

The next synonym in the *Species Plantarum*, that comes under consideration, is that of Caspar Bauhin :

OROBANCHE majore flore. *Bauhin. Pin.* 88.

This author quotes only the *Orobanche quarta* of Lobel's *Icones*, and an *Orobanche* of the *Hortus Eystetensis*, a work I have not in my possession. We must conclude that he intended the *Orobanche cærulea*, especially as he has the *Orchis abortiva* in the preceding page, by the name of *Orobanche Monspeliaca floribus oblongis*, under which he properly cites Lobel and Clusius.

Morison's figure, mentioned above, is also referred to by Linnæus, in the same paragraph in which he quotes C. Bauhin. What this author has said, p. 502, likewise refers to the *Orobanche cærulea*; and he rightly quotes another paragraph of Clusius, who, in his *Historia*, p. 271, in a slight and superficial way mentions having seen the same plant growing in corn-fields at Montpellier, upon common thistles.—Morison has the *Orchis abortiva* in the same plate with the above, *fig.* 4, and, in p. 502 of his letter-press, copies John Bauhin's account of it as an *Orobanche*. He describes this very plant over again, p. 503, n. 19, but without a figure.

The only remaining synonym in the *Species Plantarum* is that of Sauvages, from his *Methodus Foliorum*, which is an arrangement of the Montpellier plants, both wild and cultivated, according to their leaves :

OROBANCHE caule simplici cæruleo bracteis brevibus.

Sauv. Meth. 4.

This author quotes John Bauhin only; and as he has the *Orchis abortiva* in the same page, under the name of *Limodorum*, there can be

no doubt of his having, in the paragraph above referred to, intended the *Orobanche cærulea*, though he either did not read, or did not attend to, Bauhin's description. He has moreover a repetition of *Orchis abortiva*, p. 23, n. 114.

I beg leave to conclude with a reference to one original author at least, who really studied and understood the plants he enumerated, as well as the books he quoted, Magnol in his *Botanicum Montpellienfe*.

This writer, p. 195, evidently describes the *Orchis abortiva* by the name of *Orobanche magna purpurea Monspessulana*, I. B, referring also to Lobel and Clusius. He mentions having often gathered the plant in the wood of Gramont in April and May, and justly criticises the figures of the above authors. "The lower lip of the flower in Clusius's figure," he observes, "is cloven, which is not the case in the Montpellier plant." This figure I have already pointed out as representing the *Ophrys Nidus Avis*. Magnol farther remarks, that "the figure of Bauhin is faulty, there being no proportion between the stem and flowers; and that it is a copy of the *Orobanche quarta* of Lobel. The figure of Lobel," he adds, "would have been better if the roots had been drawn as in that of Clusius, and the flowers represented with short spurs."—From all this there can be no question about the plant of Magnol; and Gouan, though he quotes him under *Orobanche lævis*, Hort. Monsp. 308, expresses a suspicion that he meant the *Orchis abortiva*: but neither of these writers, nor any following one that I can find, has hit upon the true cause of all the confusion that has enveloped the plants in question, which is John Bauhin's having copied one figure of Lobel for the other. Magnol has our *Orobanche cærulea*, p. 196, by the name of *Orobanche subcæruleo flore, five secunda Clusii*; and mentions having

having often found it, in the month of May, in grassy places near the sea—the very situation in which it occurs in Norfolk. Gouan very erroneously refers to this synonym of Magnol as belonging to *Orobanche ramosa*. The *Botanicum Monspeliense* of Magnol being to the Montpellier botanists what Ray's *Synopsis* is to our English ones, they are necessarily supposed to know every plant it contains; and what they really do not understand, they refer to some other species as varieties, but too often on insufficient grounds.

To contribute something more towards the history of this confused genus of *Orobanche*, I shall add the characters of two foreign species not hitherto ascertained. The British ones will soon be more fully elucidated than they have hitherto been, by the labours of the Rev. Mr. Sutton, a member of this Society. Our joint observations, particularly the characters we have discovered for discriminating the species, may perhaps be of use to botanists of other countries, who may make still farther discoveries than we have made; so that in time a tolerably complete history of the genus may be obtained, for which we have scarcely materials at present sufficient.

I. *OROBANCHE caryophyllacea*.

O. caule simplici, corolla inflata fimbriato-crispa; labio inferiore laciniis obtusis æqualibus, staminibus intus basi hirsutis.

O. major. Pollich Palatin. v. ii. 200.

O. major, caryophyllum olens. Baubin. Pin. 87.

Gathered on shrubby hills near Valcimara at the foot of the Apennines, in April 1787. Tour on the Continent, vol. ii. 308. Linnæus received the same from Siberia.

This has very much the habit of the *Orobanche major* of Engl. Bot. t. 421. and all other British authors, and has been so universally

confounded with it by foreigners, that it is utterly impossible to allot to each its proper synonyms, no botanist having as yet properly described the stamina, in which the true character resides; much less do the figures of old authors lend any assistance towards this discrimination. I here quote Caspar Bauhin, merely on account of his mentioning the clove-like smell: in his synonyms he appears to confound these two, and possibly several more species. We have no reason to think that Linnæus intended the one more than the other for his *O. major*, he having preserved no Swedish specimen; but I have retained that name for the English plant, which is also the more common of the two throughout Europe. When some English writers tell us it has "a faint smell of cloves," I believe that remark has been made rather from regard to books than to nature; for the *O. caryophyllacea* has indeed not a *faint*, but a very strong and fragrant smell of cloves when fresh, as I can witness: but I never met with any body who could perceive the least degree of the same smell in any *Orobanche* found in Britain.

With respect to more modern synonyms of these two species, Villars in his *Plantes de Dauphiné*, vol. ii. 407, evidently appears to have known them both, but thought them one species; he having only been anxious to distinguish from them the *O. cærulea*, *Engl. Bot. t. 423*, about which indeed there can be no dispute. Pollich's most excellent description leaves no doubt of his *O. major* being my *caryophyllacea*; I have therefore quoted him without any hesitation. Haller under his No. 295 seems to have intended neither of these, but rather the *O. minor*, *Engl. Bot. t. 422*, except that he mentions the clove-like odour. He refers to Micheli, who published a little Italian work in octavo at Florence, in 1723, upon this *genus*, chiefly to indicate a method of extirpation. This book enumerates many varieties, among which probably our new species are all to be found.

The

The *O. minor* is the only one I have ever met with growing in such situations, or in such abundance as to be deemed a weed; and it attaches itself, as Haller observes, to the roots of *Diadelphous* plants, particularly clover. Gmelin in his *Flora Sibirica* mentions several varieties of what he took for *O. major*; but it is not possible to determine what they really are.

β Haller has recorded as a variety of his 295, a Swiss *Orobanche*, of which a drawing had been sent him, "with a very dense conical spike, a very short flower, and style projecting considerably out of it," which, he adds, "is so remarkable as to deserve being reckoned a species, provided more specimens could be discovered." This same plant is to be found in the Linnæan herbarium, gathered in eastern Pomerania by a Mr. Brunnemann, and very well preserved. If a variety of any thing, it must be *O. caryophyllacea*, with which the stamina precisely agree; nor does it differ from the other specimens in my possession, except in being more luxuriant, with a greater number of flowers in a younger, and therefore conical, spike, and in the corolla and stamina being not half so long as usual, while the style protrudes considerably. The germen is smooth; style slightly pubescent, incurved, with a dark-coloured stigma; bractæ, calyx, and divisions of the corolla exactly as in the species to which I have ventured to refer it.

I have only to observe farther, that the *Orobanche caryophyllacea* agrees very nearly with *O. major* in habit and size, as well as the appearance of its flowers; but differs from the latter in having the three segments of the lower lip obtuse, and much more fringed and curled. The germen also is entirely smooth, which in *O. major* is hairy in the upper part, and the style is much less downy than in that species. The most striking mark, however, of *O. caryophyllacea* consists in the lower part of the stamina, on the inside, being thickly

clothed with hairs, whereas that part in *O. major* is always perfectly smooth. The stigma of *O. caryophyllacea* is brown or purplish; that of *O. major* yellow.

2. *OROBANCHE gracilis*.

O. caule simplici, corolla inflata; labio inferiore brevissimo laciniis obcordatis inæqualibus fimbriato-crispis; staminibus styloque pilosis exsertis.

Gathered in hilly pastures at St. Ortese near Genoa, in July 1787.

I can meet with no synonyms for this species. It has a taller and more slender stem than *O. major*, and is upon the whole less pubescent. The bractæ are shorter than the flower. Corolla the size of *O. major*, but the upper lip is of a dark or purplish colour, and less fimbriated or crisped than in that species. The lower lip is remarkably short, in three obcordate fimbriated segments, of which the middle one is larger than the other two, and is connected at its base with the very prominent two-lobed palate of the flower. The stamina are slender, thinly clothed all over, as well as the style, with scattered hairs, and project out of the mouth of the flower. The germen is smooth. I do not recollect its having, when fresh, peculiar smell.

The *O. gracilis* has most affinity to the *minor* in some of its characters; but differs in its larger inflated corolla, short lower lip, longer stamina and hairy style.

XIII. *A Description of Five British Species of Orobanche.* By the Rev. Charles Sutton, B. D. A. L. S. late Fellow of St. John's College, Cambridge.

Read December 5, 1797.

FROM the desire of exciting a more accurate investigation and description than has hitherto been made of the several species of *Orobanche*, both British and Foreign, I transmit to the Society a description of those which are found in the county of Norfolk: I shall premise only a short observation or two upon their general habit and manner of growth.

The first thing that is apt to strike us with respect to these plants, is, that they are *Parasitic*; but they are not altogether so, like the several species of *Epidendrum*, *Viscum*, &c. They acquire sustenance and stability not only from the foster-plants to which they are attached, but also, and that in no small degree, from the soil, into which they send forth radical fibres.

All the species exhibit an ungraceful formality from the defect of leaves, and have their surface more or less beset with minute pellucid glanduliferous hairs, which project perpendicularly from the stems, squamæ, bractææ, calyces, corollæ, and are sometimes found within the flowers, upon the very stamina and pistilla: these, according to the remarks of Guettard, have each an articulation at
the

the distance of about two-thirds from their base, and are tipped with a globular sort of cup, bearing a viscid gland: we may suppose them to be intended to carry off secretions, and to answer the purposes of leaves in performing the office of respiration, &c. It is to the volatility of these secretions that we are to attribute the difficulty of preserving living specimens for any length of time, and the harsh ungracious appearance they assume in an herbarium.

They emit no smell (I speak of those only which I am about to describe), have an acrid astringent taste, and are rejected by all kinds of animals, except the minuter tribes of *Cimices* and *Thrips*.

They are acotyledons; for, when a seed has attached itself to the root of any living plant, to which it is suited by its nature to adhere, it swells into a pellucid squamose gem or bulb; and after throwing out around the point of adhesion several tender fibres, it pushes up at once into a perfect plant, without any lateral lobes or cotyledons; developing first the squamæ and then the stalk, with a capitulum of flowers concealed by bractæ, in form resembling a young head of asparagus: the flowers afterwards expand in succession upwards, and the capitulum becomes a spike. See Tab. xvii. fig. 1 and 2. —Adanson has classed this genus among his monocotyledons.

Notwithstanding what has been said of the banefulness of the *Orobanche*, that it destroys the plants which feed it, I have had no experience of the fact: to me it has ever seemed to

“ Grow with their growth, and strengthen with their strength.”

Dr. William Turner, one of our earliest and most judicious herbalists, has given us the following account of it: he calls it Choke-weed, and says, “ It is called about Morpeth in Northumberland (the place of his nativity) Newe Chappel Flower, because it

grew in a chappel there, in a certaine place called Bottell-bankes, whereas the unlearned people dyd worshyppe the image of St. Marye, and reckoned that the herbe grew in that place by the vertue of that image.—Besides it that Dioscorides wryteth, I have marked myselfe that this herbe growethe muche aboute the rootes of broome, y^e whych it claspeth aboute with certaine lyttel rootes on everye side lyke a dogge holdying a bone in his mouth: notwithstanding I have not seen any broome choked with this herbe, howbeit I have seen the herbe called three-leved grasse or claver utterly strangled, al the natural juice clene drawne oute by thys herbe.”

It is not improbable that more than one species is included in this account, for which reason I have given the extract, and that the “Choke-weed” of the clover may be different from the “Choke-weed” of the broom, and that the “Newe Chappel Flower” distinct from both, may be a species not yet defined. Be this so or not, it will at least be worth while to make further researches, and investigate what may yet remain; in particular to make enquiry after that which Mr. Curtis speaks of, on the information of Mr. Thomas White, as growing upon walls in Pembrokehire and the decayed floor of an old castle; for none of those with which we are at present acquainted are found in such situations.

* *Corollis Quadrifidis*.

I. *OROBANCHE major*.

Caule simplicissimo. Corollis quadrifidis, inflatis. Staminibus infernè nudis. Stigmate bilobo, lobis distantibus. Stylo supernè pubescente.

♀. *major*, caule simplicissimo pubescente, staminibus subexsertis.

Curtis Fl. Lond. fasc. 4. tab. 44.

O. major,

O. major, *Withering Bot. Arr. 3d edit. p. 557.*

O. major, stem simple, corolla inflated; its upper lip undivided; lower in three equal segments. Stamina smooth. Style downy. *Smith in Engl. Bot. tab. 421.*

Radix crassa, carnosæ, interdum bulbosæ, perennis, parasitica; radici lignosæ *spartii scoparii*, et *ulicis uropæi* imprimis adhærens; radiculis simplicibus, fragilissimis instructa; plures emittens caules. *Caulis* simplicissimus erectus, carnosus, angulatus, pilosus*, crassitie digiti, altitudine pedali et ultra, ex luteo fuscus, dilutè purpurascens, squamis lanceolatis sparsis, sub solo confertioribus. *Flores* spicati, pilosi, fusci, interdum purpurascens, stigmatibus flavis; persistentes rigidi, sordidè-ferruginei. *Bractææ* simplices, lanceolatæ, pilosæ, floribus interdum longiores. *Calyx*, perianthium subæquale, pilosum, diphyllum, laterale foliolis profundè bifidis, laciniis acutis inæqualibus.—Variat perianthio monophyllo quadrifido a parte posteriori usque ad basin partito. *Corolla* tubulosa, quadrifida, pilosa, tubo sursum inflato, incurvo, dorso subcarinato; faux valdè aperta; limbus bilabiatus obsolete denticulatus; labium superius fornicatum, obtusum, integrum, parum reflexum; inferius trilobum, lobis ferè æqualibus, acutis, planiusculis, intermedia dependente. *Nectarium*, glandulæ † tres anticè germini insertæ. *Stamina*, filamenta quatuor subulata, supernè pilosa, infernè omninò nuda, canaliculata plana, duo breviora lateribus, duo longiora anticæ parti tubi inserta, decurrentia, apice recurva; antheræ didymæ, altero apice mucronatæ, ad-

* Si quas plantarum partes in his descriptionibus uno verbo *pilosas* vel *pilosiusculas* dixero, pilos glanduliferos intelligat lector.

† Sic Curtis, & sic amicus noster accuratissimus D. Rob. B. Francis:—Ipse autem nullum offendi.

hærentes,

hærentes,—defloratæ unâ cum stylo exsertæ. *Pistillum*, germen oblongum, nitidum, pilosiusculum; stylus filiformis, pilosiusculus, apice pubescens, purpurascens; stigma bilobum, lobis globosis, flavis, distantibus, medio transversè rimosum. *Pericarpium*, capsula ovato-oblonga, longitudinalitèr dehiscens, unilocularis bivalvis; *Semina* minuta, numerosa, subturbinata, reticulato-cellulosa. *Receptacula*, quatuor linearia lateralia, adnata.

Floret Junio. 4

Habitat in dumetis sterilioribus, et in locis incultis—Thorp, Brook, Baconsthorp.

As this species has generally passed for *O. major*, and has been figured and described as such by the authors of the *Flora Londinensis* and *English Botany*, I have retained that trivial name, though it is now suspected not to be that of Linnæus, nor the *O. major Garyophyllum olens*, so often mentioned, of C. Bauhin. Of the many synonyms to *O. major*, quoted by Reichard in his edition of the *Systema Plantarum* of 1780, vol. 3. p. 183, it is extremely difficult which to refer to our plant: we may safely however exclude those from Bauhin *Pin.* 87.—Loeßling, p. 151, original edition,—and Pollich, No. 600. Dr. Withering, in his 3d edition of the *Bot. Arrangement*, has judiciously excluded the long description of Loeßling. I dare not quote any of his synonyms, for want of sufficient marks of discrimination: the figures he refers to in Morrifon xii. 16. 1. Gerard em. p. 1311, Clusius i. p. 270, Dodonæus p. 552, and Lobel *Ic.* ii. 89, are copies of each other, and, if meant for our plant, are very bad representations of it. J. Bauhin's ii. p. 780, is equally uncertain; that of Matthioli p. 536, copied in Gerard's *Herbal*, 1st edition, p. 1130, and that of *Tabernæmontanus*, p. 684, though not satisfactory, are a great deal better.

2. OROBANCHE *elator*. Tab. 17.

Caule simplicissimo. Corollis quadrifidis. Stamina infernè pilosis. Stigmate obcordato. Stylo supernè glabro.

Radix præcedentis, radici lignosæ *Centaureæ Scabiosæ* et *Trifolii pratensis* imprimis adhærens. *Caulis* præcedentis, sed procerior. *Flores* longè spicati, pilosi, pallidè rubescentes, venis saturationibus notati; stigmatibus flavis; persistentes, rigidi, subcompressi, ferruginei—centum et plures in eâdem spicâ interdum numeravi. *Bractææ* præcedentis. *Calyx*, perianthium abbreviatum, pilosum, monophyllum, quadrifidum, ponè usque ad basin partitum, laciniis lanceolatis, acuminatis, duabus posterioribus divaricatis, longiusculis; levitè striatum, fordidè album, lineis dilutè rubris notatum. *Corolla* tubulosa, quadrifida, pilosa; tubo cylindræo recurvo; dorso carinato; faux aperta; limbus bilabiatus, inæqualis, fimbriato-crispus; labium superiùs rotundatum, reflexum, integrum; inferiùs trilobum; lobis æqualibus, rotundatis. *Nectarium*, glandulæ quatuor nectariferæ ad basin filamentorum, tubo insertæ. *Stamina*, filamenta quatuor subulata, anticè glabra, nuda, posticè ad basin pilosa, pilis non glanduliferis, duo breviora lateribus, duo longiora anteriori tubi parti inserta. *Antheræ* didymæ, altero apice mucronatæ, levitè adhærentes; defloratæ unà cum stylo exsertæ. *Pistillum*, germen ovatum, glabrum, nudum; stylus glaber, nudus; stigma bilobum, obcordatum, flavum, medio transversè rimosum. *Pericarpium*, capsula ut congenerum. *Semina* rugosa, seu obsoletè reticulata.

Floret Julio, Augusto 4.

Habitat in agris *Trifolii pratensis*, non in sementis anno; et in marginibus

ginibus agrorum juxta *Centaureas scabiosam* et *nigram*, *Scabiosam arvensem*, &c.—Gunton, Kelling, Sheringham, Catton, Costesey, in glareosis.

This is no uncommon plant: it has hitherto been constantly confounded with the preceding; but though they are similar in general appearance, the difference between them is very discernible on a closer inspection; and they who acknowledge the force of that sentiment of Linnæus, that “*minimis partibus per totum naturæ campum certitudo omnis innititur, quas qui fugit pariter naturam fugit**,” will be ready to allow this to be a distinct species. There is reason to suppose it may have been noticed by Ray very early, though not particularly distinguished by him; for in his *Historia Plantarum circa Cantabrigiam nascentium*, printed in 1660, his first work in Botany, he speaks of having found the *O. flore majore* of J. B. “in a field of barley, on the right hand of the way between Cambridge and Grantchester, also in a corn-field at Cherryhinton,” places in which this is very likely to be found, as it grows among herbaceous plants, and never on the roots of broom or furze:—He adds, “also at Gamlingay, growing at the roots of broom plentifully:” here he undoubtedly means our *O. major*, for that is still to be found there in abundance. In his *Catalogus Plantarum Angliæ*, published ten years afterwards, he notices them thus: “*ad radices genistæ, interdum et inter fegetes.*”

3. *OROBANCHE minor*.

Caule simplicissimo. Corollis quadrifidis. Stamina infernè pilosis. Stigmate retuso. Stylo supernè glabro.

* *Philosophia Botanica*, p. 222. under the 280th aphorism: Fructificationis partes sæpius constantissimas differentias subministrant.

O. major, caule simplici, bracteis lanceolatis, flore majoribus.
Loefl. Plantæ Hispanicæ rariores, No. 35.

O. major β . minoribus floribus albidis, spicâ densiore. *Haller Stirp. Helv.* 1 edit. p. 610.

O. flore minore, *R. Syn.* 3 edit. p. 288.*

O. major β *Huds. Flo. Angl.* 1 edit. p. 232 ?

O. ramosa β *Huds. Flo. Angl.* 2 edit. p. 266 ?

O. minor. Stem simple. Corolla tubular; its upper lip undivided; lower in three curled segments, of which the middle one is lobed. Stamina ciliated. Style smooth.—*Smith in Engl. Bot.* tab. 422.

Radix priorum, squamis rarioribus; radici lignosæ *Trifolii pratensis* imprimis adhærens. *Caulis* 6—12 pollicaris, simplicissimus, erectus, teretiusculus, pilosus, crassitie ferè pennæ anserinæ, incarnatus, interdum luteus, squamosus, squamis rarioribus—caules plurimi interdum aggregati. *Flores* spicati, luteo-albidi, venis purpureis notati, pilosi—variant colore luteo;—persistentes, rigidi, ferruginei;—flos inferior sæpè pedunculatus. *Bracteæ* simplices, lanceolatae, pilosæ, ferè longitudine florum. *Calyx*, perianthium subæquale, cauli concolor, pilosum, diphyllum, laterale, foliolis nunc bifidis; laciniis angustissimis inæqualibus; nunc simplicibus lanceolatis, integris, vel uno latere incis. *Corolla* tubulosa, quadrifida, pilosa; tubo cylindraceo, patente, incurvo; dorso carinato; faux aperta; limbus bilabiatus, inæqualis; labium superiùs rotundatum, crenulatum, integrum; inferiùs trifidum, laciniis æqualibus, rotundatis crenulatis—variat intermediâ interdum trilobatâ. *Nectarium*, glandulæ quatuor crocatæ nectari-feræ ad basin filamentorum. *Stamina*, filamenta quatuor subulata, anticè glabra, nuda, posticè pilosa, pilis non glanduliferis, duo breviora lateribus, duo longiora anteriori tubi parti inserta.

Antheræ

Antherae didymæ, altero apice mucronatæ—defloratæ unâ cum stylo exsertæ. *Pistillum*, germen ovato-oblongum, nudum; stylus filiformis, subnudus; stigma retusum, margine dilatatum, purpureum, medio transversè rimosum, aliquando monstrosum evadit triangulare vel quadratum. *Pericarpium*, capsula ut congenerum. *Semina* rugosa, vel obsoletè reticulata.

Dignoscitur prima facie—a præcedente, calyce diphylo variabili;

—a majore, corollâ cylindraceâ;

—ab utrâque, corollâ minore.

Floret Julio, Augusto, 4 vel 8.

Habitat in agris ad radices *Trifolii pratensis*, non in fementis anno; et in pascuis inter *Hypochaeris radicata*, &c.—Sheringham, Weyborn, Eaton, Frettenham.

Having been favoured by the President with a sight of the plants in the Linnæan herbarium, it was with great pleasure I found there one of this species: it was inscribed by Linnæus, *Orobanche major*, and was given him by Loeffling; most probably it was one of those from the King of Spain's garden at Aranjuez, found at the roots of elms, which Loeffling has described among his *Plantæ Hispaniæ rariores*. That it forms a distinct species there can now be very little doubt: the figure in *English Botany* is taken from one of my specimens—it represents the calyx perfectly well, but not the stigmata. It is frequently to be found with a much longer spike; in which case the flowers are not only more numerous, but are much closer set than in the figure. From its growing so very copiously among clover, I am of opinion it is the same which Dr. Turner noticed as being so pernicious to it. None of the other old Herbalists have mentioned it, nor has it been introduced into any of our British Floras, if we except Hudson, who is thought to have it in his first.

first edition of *Flo. Angl.*; but, from his uncertainty respecting it afterwards, it should seem he took it upon trust from Dillenius, rather than from any knowledge he himself had of it. Dillenius, in his edition of *Ray's Synopsis*, speaks of its being found in a field of oats near Rochester. It might possibly be not unknown to Ray. I am at least inclined to think so, from a passage in his *Historia Plantarum*, vol. ii. p. 1227, where having described the *O. majore flore* J. B. he adds, "*O. flore minore* J. B. adeo parum differt a præcedente ut specie diversum esse mihi persuadere vix possum."

* * *Corollis quinquefidis.*

4. *OROBANCHE cærulea.*

Caule subsimplici. Corollis quinquefidis. Bracteis ternis. Calycibus tubulatis, femiquadrifidis.

O. lævis, caule simplicissimo, lævi, staminibus exsertis. *Syst. Plant. ed. Reichard. vol. iii. p. 183.*

O. purpurascens, caule simplicissimo pubescente staminibus inclusis. *Syst. Nat. ed. Gmelin, p. 954.*

O. purpurea, caule simplicissimo pubescente staminibus inclusis. *Jacquin Flo. Aust. tab. 276.—Ibid. enum. Vindob. Obs. 50.*

O. caule simplici, stipulis ternatis, calyce quinquefido. *Haller Stirp. Helv. 2 edit. No. 294.*

O. floribus cæruleis laxè spicatis. *Gmelin Flo. Sib. vol. iii. p. 215. tab. 46. fig. 1.*

O. cærulea, caule simplici, basi bulboso, floribus numerosis incurvis. *Villars Dauph. vol. ii. p. 406.*

O. ramosa β. *Withering Bot. Arr. 3 edit. p. 558.*

O. cærulea. Stem simple. Corolla tubular; its upper lip cloven and notched, lower in three equal entire segments. Stamina smooth. Bractææ three. *Smith in Engl. Bot. tab. 423.*

Radix

Radix ut congenerum; radiculis diversarum herbarum radices complectentibus. *Caulis* 6—10 pollicaris, subsimplex, erectus, rigidus, pilosiusculus, parum flexuosus, angulatus, sublignosus, ex luteo olivaceus, crassitie pennæ anserinæ vel cygneæ, squamosus, squamis ovato-lanceolatis. *Flores* laxè spicati (spicâ obtusiusculâ), violacei, venis saturatioribus notati, levitè pilosi, floribus *ramosæ* affines sed majores; persistentes torti, compressi, cernui, fusci—flos inferior sæpè pedunculatus. *Bractææ* ternæ calyci vix æquales, duæ laterales interiores lineari-lanceolatæ, intermedia exterior ovato-lanceolata, pilosæ, pilis brevibus. *Calyx*, perianthium monophyllum, cauli concolor, tubulatum, semiquadrifidum, laciniis æqualibus lanceolatis, acuminatis, pilosis, cum rudimento quintæ ad incisuram profundiorē posticam; interdum, sed rarò, adest quinquefidum cum rudimento sextæ posticæ. *Corolla* ringens quinquefida, pilosa, calyce duplo longior, tubo infernè tereti, supernè sensim ampliato, compresso-triangulari; dorso acutè carinato, medio obtusiusculè incurvo; faux dehiscens; limbus bilabiatus subæqualis; labium superiùs bifidum, laciniis obtusiusculis, reflexis denticulatis, venis majoribus in dentes eductis; inferiùs trilobum, laciniis æqualibus acutiusculis; palatum sericeum, pilis scilicet albis, non glanduliferis, adpressis, tectum. *Nectarium* frustra quæsi. *Stamina*, filamenta quatuor filiformia, nuda, glabra, vix recurva, duo breviora lateribus, duo longiora anteriori tubi parti inserta. *Antheræ* luteo-albidæ, conniventes intra faucem—defloratæ inclusæ. *Pistillum*, germen ovato-oblongum, nudum, læve; stylus filiformis, incurvus, pilosiusculus; stigma capitatum, album, bilobum, nec rimosum, faucem claudens. *Pericarpium*, capsula ovato-oblonga, medio fulcata, longitudinalitèr dehiscens. *Semina* minuta numerosa, subturbinata, reticulato-cellulosa.

Floret Julio 4.

Habitat

Habitat inter gramina, in pascuis, et ad margines agrorum—
Sheringham juxta mare, Beeston, et Northrepps.

We are entered now upon a division of the genus in which the species, besides having the upper lip of the corolla divided, differ in many respects from those in the last: the shape of the flower is no longer cylindrical; the stamina are short and filiform, the stigma with no apparent transverse fissure, the calyx tubular, the bractæ ternate, and the plants altogether less succulent and perhaps less parasitic. The character therefore being in general so different, and more obvious marks of discrimination presenting themselves in this division, I presume a small deviation from the form of the specific definitions before laid down may be allowed.

The stem in this species, though generally, is not always unbranched; the Rev. R. B. Francis of Holt has remarked to me, that, if mutilated, it will throw out lateral shoots; and I have observed, that this is not the case with any of the three foregoing species; for if the entire spike of any of them is broken off, even at an early period, the stem decays; and if great part of it only is broken off, the work of nature is carried on in perfecting the few flowers that remain, on elongated footstalks.—From this circumstance, and from having also seen a perfect specimen that was branched towards the bottom, I have been induced to define this species *Caule subsimplici*.

The little that was known of it in England, till lately, was from Mr. Pitchford's specimen found in 1779, and Mr. Lightfoot's (see *With. Bot. Arr.* p. 558, and *Engl. Bot.* p. 184.) Being most allied to the *ramosa*, it was taken at first for a variety of it, and described as such in Withering, though with a very incorrect reference to its *habitat*. In 1796 Mr. Scrimshire found several at Sheringham, and I found
a few

a few at the adjoining parish of Beeston, one of which I presented to the Society in February last. It seems to have been more generally found abroad, where it has usually passed for that unknown species of Linnæus, the *O. lævis*; a mistake arising, as I have been convinced by the President, from a wrong application of synonyms in the *Species Plantarum*.—See the preceding paper.

5. *OROBANCHE ramosa*.

Caule ramoso. Corollis quinquefidis. Bracteis ternis. Calycibus brevibus, profundè quadrifidis.

O. ramosa, caule ramoso, corollis quinquefidis.—*Syst. Plant. ed. Reichard*, p. 184.—*Pollich Flo. Pal. n.* 601.

O. caule ramoso, flore quinquepartito.—*Haller*, 2 edit. n. 296.

O. ramosa, caule subramoso, corollis quinquefidis.—*Hudson Flo. Ang.* 2 edit. p. 266.

O. ramosa. — *Raii Syn.* 3 edit. p. 288.* — *With. Bot. Arr.* 3 edit. p. 558.

O. ramosa, stem generally branched, corolla with five segments. — *Smith in Engl. Bot. tab.* 184.

Radix congenerum, annua, vix squamosa, *Cannabis sativæ* radicibus cauleque imprimis implicata. *Caulis* 6—10 pollicaris, erectus, subflexuosus, teres, pilosus, sublignosus, luteo-purpurascens, crassitie ferè pennæ anserinæ, basi ramosus, ramis caule brevioribus, squamosus, squamis raris ovato-lanceolatis, citò fufcescentibus; interdum simplex. *Flores* spicati (spica acuta) ex albido cœrulei, venis cœruleis notati, pilosi; persistentes declinati, tubo supernè compresso, infernè ventricosiore, fusci—flos inferior sæpe pedunculatus. *Bracteæ* ternæ breves, calyci vix æquales, membranaceæ, citò fufcescentes, duæ laterales interiores, lanceolatæ acuminatæ,

minatæ, exterior ovato-lanceolata. *Calyx*, perianthium monophyllum, hyalinum, dimidio corollæ brevior, scilicet ad corollæ longitudinem in ratione 2 ad 5; latius et profundius ad posticam quam ad anticam partem, ibique quam ad latera, incisum; laciniis æqualibus, lanceolatis, acutis. *Corolla* ringens, quinquesida, pilosa, tubo internè terete, supernè sensim ampliato, compresso-triangulari; dorso carinato incurvo; faux dehiscens; limbus bilabiatus inæqualis; labium superius rotundatum, breviusculum, bifidum edentatum, reflexum; inferius trilobum, laciniis æqualibus, rotundatis, porrectis. Palatum ex albido luteum, pilis albidis non glanduliferis barbatum. *Nectarium* nullum. *Stamina*, filamenta præcedentis, pilosiuscula, purpurascens. *Antheræ* luteo-albidæ, intra faucem tectæ,—defloratæ inclusæ. *Pistillum*, germen quadrato-ovatum nitidum, pilosiusculum; Stylus filiformis, incurvus, pilosiusculus, purpurascens; Stigma retusum, margine dilatatum, albidum, non rimosum. *Pericarpium*, capsula quadrato-ovata, longitudinalitèr dehiscens. *Semina* minuta numerosa, subturbinata, reticulato-cellulosa.

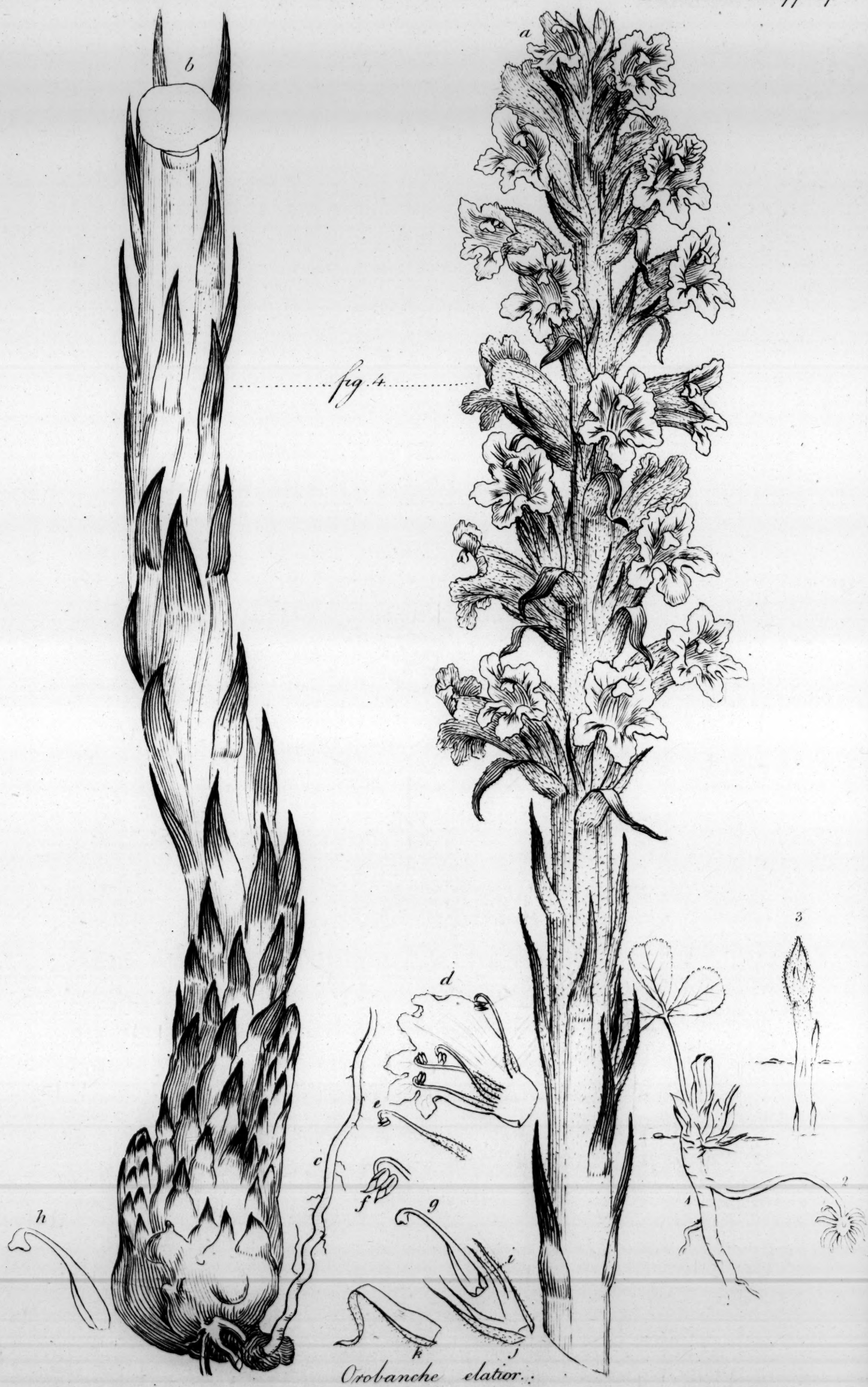
Floret Augusto, Septembri ☉.

Dignoscitur a præcedente — Spicis acutis; caule et ramis parùm squamosis; calycibus bracteisque dimidio corollæ brevioribus; tubo post florescentiam internè globofo.

This species was first found in Norfolk, by Mr. Woodward, in the year 1785, in a hemp field at Brome. He found it again, some time afterwards, in a similar situation, on the opposite side of the river at Mettingham, near Beccles, in Suffolk—the place where it is reported to have been found, in the time of Dillenius, by Dr. James Sherard. It grows also among the hemp at Outwell, in Norfolk. The seeds of both were probably introduced into England together.

In





In the *Botanical Arrangement* it is said to be found "in corn-fields and dry pastures;" and in the *Species Plantarum*, "in ficcis." We have known it found in no other than a very rich, light, and moist soil. It may be doubted whether the *O. ramosa* of Osbeck, p. 58 of the original edition, and p. 78 of the English translation, be the same species with ours, or not.

EXPLANATION OF TAB. XVII.

Fig. 1. Represents a root of the *Trifolium pratense* in the second year of its growth.

2. An embryo plant of *Orobanche minor*, attached firmly by its centre, which is a yellow pellucid gem, covered with a few squamæ, to the root of the *Trifolium*, and throwing out fibres of a brownish colour into the surrounding soil.
3. A young plant just risen to a capitulum, covered above the surface of the earth with pellucid glanduliferous hairs.
4. *Orobanche elatior*, in its natural size.
 - a. The spike.
 - b. That part of the stem which is found below the surface of the earth. Note—*a* and *b* are not correspondent parts. The intermediate part, which connects the bottom of *a* with the top of *b*, needs no figure for explanation; it is usually about the length of *b*.
 - c. Part of the root of *Centaurea scabiosa*.
 - d. The corolla expanded.
 - e. One of the stamina.

B b 2

f. The

- f. The anthera magnified.
- g. The pistillum.
- h. The same somewhat magnified.
- i. A part of the corolla in the form of a squama frequently remaining attached to the germen.
- j. The calyx.
- k. The bractea.

XIV. *Account, accompanied by a Figure, of a minute Ichneumon.* By
George Shaw, M.D. F.R.S. V.P.L.S.

Read Nov. 7, 1797.

THIS accurate microscopic drawing was made some years ago, of a species of *Ichneumon*, which may perhaps be the *Ichneumon atomos* of Linnæus, an insect which in the *Systema Naturæ* is said to be found at Upsal, and to be smaller than a common mite. Such was certainly the case with the insect from which the figure was taken, and which, when living, was scarce to be perceived, except when in motion on the surface of the window on which it was discovered. It may be doubted, however, whether it be the *Ichneumon atomos* of the *Systema Naturæ*, since it did not appear to be varied with whitish, as there described, but to be rather of an uniform polished black. The wings are beautifully iridescent, and are edged with extremely long black hairs.

Its character (supposing it not to be the *Ichneumon atomos* of Linnæus) may be thus described:

ICHNEUMON *punctum*.

Ichneumon niger nitidus, alis iricoloribus, margine pilis longissimis nigris.

TAB. 18. fig. 1. represents the *Ichneumon punctum* highly magnified.

XV. *Description of the Phasma dilatatum.* By Mr. John Parkinson,
F. L. S.

Read Nov. 7, 1797.

THIS singular animal, which appears to be a species hitherto undescribed, is at present in the Leverian Museum. It is supposed to be a native of Asia; and belongs to that tribe of insects which Stoll has called by the title of Spectres, and which constitute a distinct genus from that of *Mantis*. The present species measures six inches and a quarter from the upper part or top of the head to the extremity of the abdomen. The whole animal is of a flattened form, more especially on the abdomen, which measures about an inch and a half across in its broadest part. The thorax is of an obtusely rhomboidal form, the sides sloping each way from the flattish upper part. The whole thorax is not only edged with spines, but has also several very sharp ones distantly scattered over its surface. The head rises up backwards into an obtusely conic shape, and has several very strong and large spines or processes. The abdomen is edged, almost throughout its whole length, with a continued series of small spines, to the number of five on the side of each individual segment: the extreme segments are without spines. The thighs, or first joints of the lower pair of legs, are in this insect remarkably strong, of a somewhat triangular shape, and beset with
some

some strong spines; but the tibiæ, or second joints, are armed with far larger and stronger ones. The upper and middle pair of legs are of a nearly similar structure in proportion, but much less strongly spined. The colour of all the legs is green, tinged with brown; the spines blackish. The general colour of the thorax, abdomen and head is now brown, but might probably have been of a greenish cast in the living animal. The wings are scarcely larger than the elytra or wing-sheaths, and seem originally to have been reddish, a tinge of that colour still pervading some parts of the wings; the tips are green. These wings are very strongly veined with brown fibres. The wing-cases are of a strong opaque green, and were doubtless more vivid in the living insect. They have a great resemblance to a pair of leaves. The mouth has four palpi, which are rather long; and under the mouth are situated two leaf-shaped organs, perhaps belonging to the action of that part. The antennæ are wanting, the first joints alone remaining. The abdomen is terminated by a kind of boat-shaped organ, the keel of which possesses a considerable space beneath the abdomen, so that fewer segments appear on that part than above. The concavity of this organ is covered above by a terminal scale and bifid process, constituting the tip of the abdomen on the upper part. On raising this valve, an *ovum*, nearly of the size of a pea, but of a more lengthened form, was discovered lying in the cavity beneath; and on inspecting farther into the cavity of the abdomen, a great many more *ova*, exactly similar, were found, to the number of five or six-and-twenty—some still remaining in the upper part. These eggs are of a slightly oblong shape, but flattened at one end: they are of a brown colour, and marked all over with numerous impressed points; and have on one side a mark or double-waved line, so disposed as to represent a kind of cross, as if curved on the surface: the flattened
end

end is furrounded by a small rim or ledge, and seems to be the part which opens at the exclusion of the larva, since it readily separates from the rest. On immerfing fome of these *ova* in warm water, and opening them, the included yolk, of a deep yellow colour, and of the appearance of a transparent gum, was discovered; and this, when burned, afforded the ufual fmell of animal fubftances, but in fome it was accompanied by a flight degree of fragrance. It is perhaps needless to obferve, that these mature *ova* clearly prove the infect to be in its complete or ultimate ftate, and not in that of a larva.

TAB. 18. *fig. 2.* is an accurate representation of the infect in its natural fize and colours.

Fig. 3. fhews the boat-shaped organ on the lower fide of the abdomen.

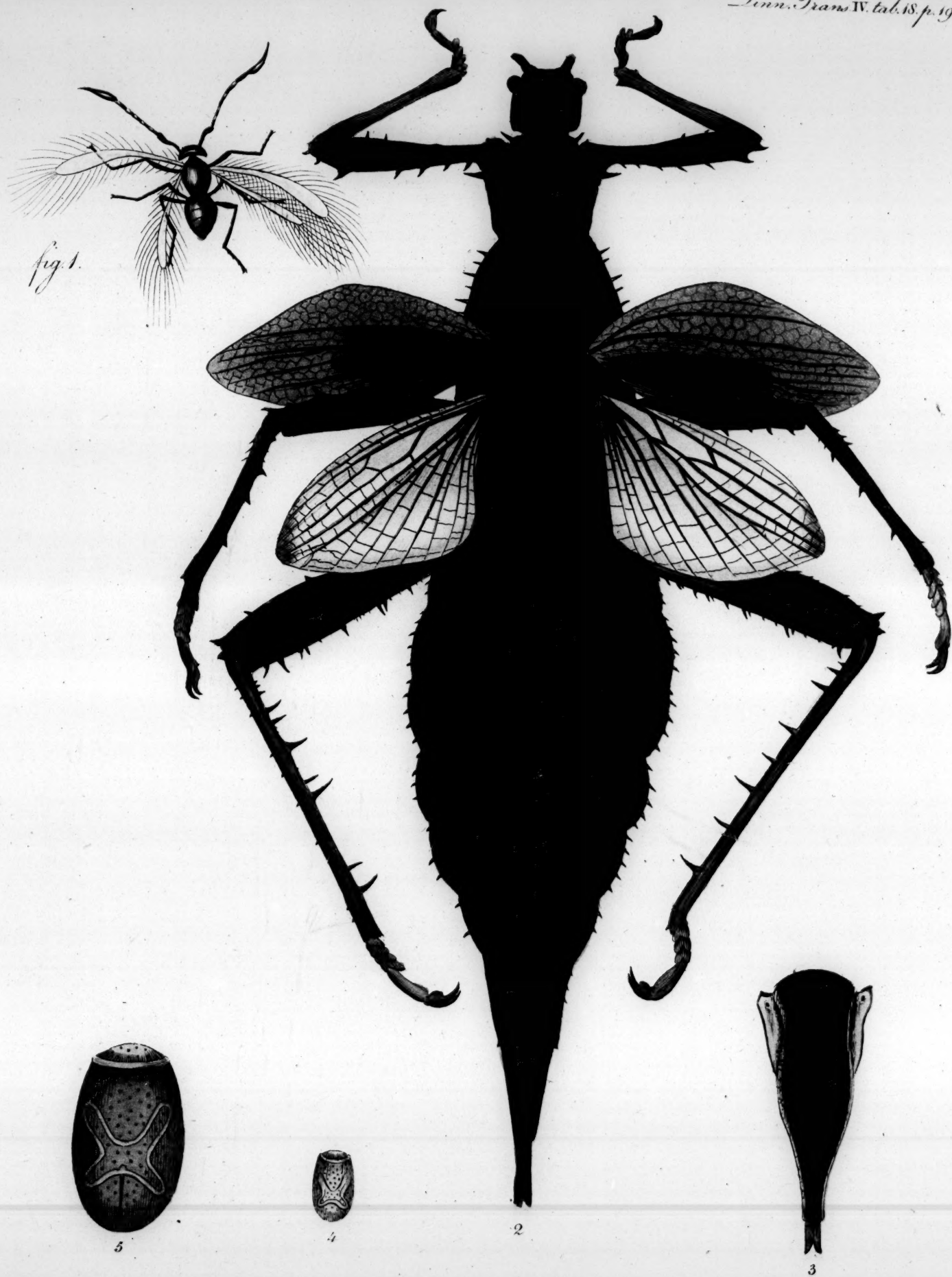
Fig. 4. represents an *ovum* in its natural fize.

Fig. 5. the fame magnified.

Dr. Shaw, who affifted in the examination of the infect, has thus given its fpecific character, viz.

Phasma dilatatum, thorace dilatato rhombeato pedibusque spinosis, abdomine lanceolato, lateribus ciliato-spinosis.

Linnaeus Trans. IV. tab. 18. p. 192.





XVI. *Description of the Blight of Wheat, Uredo Frumenti.* By
A. B. Lambert, Esq. F.R.S. V.P.L.S.

Read December 5, 1797.

THE wheat in the West of England, especially in the counties of Wilts and Somerset, has of late years been very much injured, by what is called there the *Blight*, and generally supposed to be owing to an insect. In the year 1797 the wheat was very much hurt by it, and a few years before there were several fields near Warminster so much injured that the farmers were obliged to have it cut down long before it was ripe; for, as soon as a field is blasted, as they call it, which happens sometimes in a day and night, vegetation stops, and the only way to preserve the crop from being entirely lost is to reap it immediately.—I remember seeing a remarkably fine field of wheat, after one day's warm rain, look at a small distance as if it were covered with foot, which I was informed was owing to insects, but on examination I found to be a *Fungus*, which, no doubt, had been long sown in the stem of the wheat, but wanted that kind of weather to occasion its vegetation. The stem of the wheat where this *Fungus* appears is split; and when a whole stem is almost covered with it, which is generally the case, it hinders the plant's growth.

I find the genus to which this *Fungus* belongs well described by

VOL. IV.

Cc

Perfoon,

Perfoon, under the name of *Uredo*, in a work published by him, intitled, *Tentamen Dispositionis Methodicæ Fungorum*, 1797, p. 13. "Pulvere farinaceo, thecâ orbato, sub foliorum cauliumque epidermide effuso, hâc demùm margine lævi ruptâ." In page 57, he describes different species; but does not mention that I have observed, which I suppose to be a new one, and which I shall call

URED O Frumenti, lineari-oblonga fusco-nigricans.

It is always found on the stem of the wheat. The *Uredo segetum* of Perfoon, var. α Hordei, β Tritici, γ Avenæ, affects only the parts of fructification.

It is in wet seasons that the wheat is the most injured by this *Fungus*, particularly what grows in low ground, as the crops on the hilly country are seldom hurt. I am informed it is only within these last twelve or fourteen years that it has been noticed in the West of England, or at least that the wheat has been known to be injured by it; and may it not proceed from the land being too much worked, and not having that rest given it that it requires? Whether this cause might have first brought the disease, or whether it might arise from a want of a change of crops, I leave to those to determine who are more in the way of making observations upon Agriculture than myself.

See a figure of this *Uredo* in Sowerby's *Fungi*, vol. 2. tab. 140.

XVII. *Ammophila*, a new Genus of Insects in the Class Hymenoptera, including the *Sphex sabulosa* of Linnæus. By the Rev. William Kirby, F. L. S.

Read December 5, 1797.

IN no department of the animal kingdom is the Divine Wisdom more eminently conspicuous, than in the construction and œconomy of the insect tribes; and amongst these, none, perhaps, are more worthy of our attention, on both these accounts, than the individuals that compose the class *Hymenoptera*. Though they do not, like many of the *Coleoptera* and *Lepidoptera*, immediately attract our notice by the brilliancy or gaiety of their colouring (*a*), yet when we examine them closely, and observe the consummate skill manifested in their construction; when we attend to their history, replete, be they gregarious or solitary, with entertaining anecdotes, and furnishing instances of the most astonishing sagacity and most prudent precaution; we feel inclined to prefer the study of this order of insects to that of any other, not only as most prolific of materials to set forth the praises of Him who hath created them, which is the first duty of the Naturalist—but also as gratifying, in a

(*a*) Some of them, however, are singularly beautiful even in this respect. Take for examples the *Tenthredo nitens*, many of the *Ichneumons* of Linnæus's last family, and the whole genus *Chrysis*.

high degree, our natural taste for the inspection of things that are remarkable either for their beauty, their structure, or their uses.

Amongst the parts which distinguish this class of insects from others, there is none more singular, both for its utility and construction, than the tongue and the valves which inclose and defend it: for this instrument is not confined to one or two genera, as seems to have been the opinion of Linnæus and the majority of Entomologists; but belongs, as I have reason to believe in consequence of repeated dissections of this part, to a very large majority of the class; although in some, on account of their diminutive size, it may not be visible, unless the eye of the examiner be assisted by a very strong magnifier.

By means of this instrument the *Hymenoptera*, I apprehend, contribute very considerably towards the depuration of the air; for the sweets which the flowers would exhale, were it not for myriads of these insects, which feast upon their nectar during the summer and autumnal months (*b*), would probably render that element impure and unfit for respiration (*c*). I have heard of persons that have been nearly suffocated by the odour of flowers placed in their bed-chamber.

This part, so important to these insects, will furnish, I feel persuaded, a very appropriate character to distinguish many of the

(*b*) Hymenopterous insects, especially those that are provided with a short rostrum, are most abundant upon umbelliferous plants. Upon these, particularly the *Daucus carota*, the Entomologist will find many of the rarer species of the splendid genus *Chrysis*.

(*c*) The wisdom of Providence has not only been attentive to provide against the atmosphere's being overloaded with sweets; it has also used similar precautions to prevent its being corrupted by exhalations of a contrary nature: and to effect this purpose, it employs an infinite number of insects. (Which class of animals, in conjunction with the *Fungi*, may be called the depurators and scavengers of Nature). Witness the myriads to be found in their different states in dung and all putrescent substances.

genera

genera in the class, which are now very much confused. This persuasion is the result of an examination of what Fabricius terms the *instrumenta cibaria*, in order to fix upon an essential character, more determinate than the present, for the genus *Apis*. I found that the tongue was of one form in *Sphex*, of another in *Vespa*, and of another still in *Apis*. Amongst the insects which I dissected with this view, was the *Sphex sabulosa* of Linnæus; and I was not a little surprised to find that it was furnished with an inflexed *rostrum* (d), which concealed a long, retractile, tubular tongue, with a bifid *clava* at its end (e): whereas the tongue of true *Spheges*, such at least as I have examined, is very short, flat, dilated, and nearly entire at the apex (f). It agreed with the tongue of *Vespa*, in being divided at the end; but in this latter genus, that part is extremely short and broad, obcordate, very deeply bifid, having its lobes sometimes tipped with a small callous point (g). It had a still stronger affinity with that member in *Apis*, especially in those species that have an inflexed *rostrum* (h), but in these the tongue is entire, and usually acute. In many other circumstances this insect differs from all those genera, as will appear when I give its natural character.

The possession of three other British species, which agree with this in the peculiar form of the *rostrum* and *maxillæ*, as well as in habit and other circumstances, makes my hesitation the less to consider them as distinct from the genus *Sphex*, and more particularly as Linnæus has placed an insect exhibiting the same characters amongst his *Apes*, under the name of *Apis Ichneumonea*. This will appear, I

(d) Tab. XIX. No. I. fig. 4. a.

(e) fig. 3.

(f) Tab. XIX. No. II. fig. 2.

(g) Tab. XIX. No. III. fig. 2. See also *Reaumur*, Tom. V. Tab. 16. fig. 2. and *De Geer*, Tom. II. Partie II. Tab. 26. fig. 10, 11.

(h) Tab. XIX. No. IV. fig. 2.

think,

think, evident to every one who consults De Geer's figure of that insect (*i*). Indeed that author describes the rostrum as having a different direction from that which is mentioned above (*k*), and which is observable in all my species of *Ammophila*: yet since he could have no opportunity of examining a recent specimen, (this insect being a native of South America,) he might very easily have been misled in this point; for the rostrum readily assumes and retains a direction outwards, although its natural position when at rest is inwards.

It is singular that so attentive and accurate an observer should have entirely overlooked this conspicuous part in *Sphex sabulosus*, especially as it had not escaped the notice of Linnæus.

I have given this genus the name of *Ammophila*, because those species with which I am acquainted frequent sandy banks, particularly such as are exposed to the sun.

This is nearly allied to several genera. The *Sphex sabulosus* one would take at first sight for an *Ichneumon*, and Geoffroy (*l*) has ranked it under that genus. It has the antennæ, fierce port, and manners of *Sphex*: its bifid tongue connects it with *Vespa*; and the inflexed direction and form of the valves of its rostrum give it an alliance with a large number of *Apes*. On this account I would place it between the two latter genera.

Linnæus, in an admirable "*Methodus demonstrandi lapides, vegetabilia, aut animalia*," which I have seen at the end of some editions of his *Systema Naturæ*, under the article *Genus*, lays down the *Charaeter naturalis* as a necessary part of it; although he has only given *natural characters* in his *Genera Plantarum*. Fabricius is the first Entomo-

(*i*) Tom. II. Partie II. Tab. 32. fig. 13—16.

(*k*) Mem. XII. p. 761.

(*l*) Tom. II. p. 349. n. 63.

logist who has drawn out natural characters for insects (*m*). To point out at first those circumstances in which all the individuals of a genus agree, is certainly extremely useful, and spares much unnecessary tautology when we come to describe them. I shall therefore follow his example upon the present occasion.

AMMOPHILA.

Sandwasp.

CHARACTER NATURALIS.

Caput suborbiculatum, subdepressum. *Rostrum* corneum, inflexum, subulato-conicum (*n*), *vaginâ* trivalvi; *valvulis* duabus superioribus (*o*) semisagittatis medio palpigeris, *palpis* flexu-articulatis; inferiori (*p*) apice biaristatâ (*q*), *aristis* membranaceis; *palpis* duobus quadriarticulatis instructâ (*r*); *linguam* submembranaceam, retractilem, tubulosam, subclavatam, *clavâ* bifidâ, exerens (*s*). *Labium* inflexum. *Maxillæ* forcipatæ minaces, apice tridentatæ, dente interiori minimo, intermedio magno truncato, exteriori maximo acuminato (*t*). *Antennæ* filiformes, thorace breviores, sæpius tredecim articulorum (*u*), medio frontis insertæ (*v*). *Oculi* ovales, distantes. *Stemmata* in triangulum disposita.

(*m*) Ego primus, in Entomologiâ, characteres naturales composui, introduxi, quibus omne systema niti debet. *Fabric. Philos. Entomol. Hamburg. 1778, VI. § 28.*

(*n*) Tab. XIX. No. I. fig. 4. a.

(*o*) fig. 1.

(*p*) fig. 2. c.

(*q*) fig. 2. dd.

(*r*) fig. 2. e.

(*s*) fig. 2. f. and fig. 3.

(*t*) fig. 5.

(*u*) The three first joints of the antennæ differ in form from the rest—The first, or *bulb*, is scarcely visible without a magnifier, the second is very large, and the third very small. In one species they consist of fourteen joints.

(*v*) fig. 6.

Collum :

Collum infundibuliforme (w).

Thorax subcompressus ponè alarum insertionem elongatus (x).

Scutellum obsoletum.

Alæ planæ, venosæ, *anastomosi* obsoletâ.

Abdomen petiolatum glabrum, *aculeo* in fœminis recondito.

Pedes longi, graciles, setosi (y). *Femora* apophyibus biarticulatis infidentia (z). *Tibiarum* posticarum spinulæ interiores uno latere pectinatae (a). *Tarsi* quinque-articulati.

Color niger, abdominis *cingulo* ferrugineo.

Many of these characters are peculiar to this genus, particularly the form of the *rostrum*, *maxillæ*, *collum*, and the pectinated *spinulæ* of the posterior *tibiæ*. Even *colour*, so various in other genera, in this seems characteristic. To the above marks it might be added, that, in all the species I am going to describe, the under sides of the posterior *tibiæ* are covered with a short pale down.

CHARACTER ESSENTIALIS.

Rostrum conicum inflexum, linguam bifidam exerens.

Antennæ filiformes in omni sexu, articulis subquatuordecim.

(w) Tab. XIX. No. I. fig. 7.

(x) That part of the thorax which is behind the wings, I believe I shall name upon a future occasion the *Metathorax*, as it is separated in hymenopterous insects both from the thorax and scutellum by a suture, and in descriptions often requires distinct notice.

(y) Fig. 8.

(z) Fig. 8. a.

(a) Fig. 10. I conjecture that this pecten is serviceable to the insects of this genus in the excavation of the little burrows, where they deposit the animal to which they have committed an egg. When with their hind legs they dissipate (*ruspando*) the little heap of sand from the mouth of the burrow, which they had scratched with their fore ones from its bottom, this pecten will prevent the grains from passing between this spine and the base of the tarsus, which is also pectinated, although less visibly. Fig. 9. a.

Oculi

Oculi ovales.

Alæ planæ.

Aculeus reconditus.

These characters, I think, will sufficiently distinguish our *Ammophila* from those genera to which it is most nearly related. The direction of the rostrum in this genus, the form of the eyes, and the plane surface of the wings, clearly prove it to be distinct from *Vespa*. The bifid tongue, and the antennæ filiform in every sex (*b*), separate it from *Apis*. The direction and length of the rostrum, and the bifid tongue, divide it from *Sphex*. The same part in conjunction with the number of articulations, and form of the antennæ, prevent its being confounded with *Ichneumon*.

SYNOPSIS SPECIERUM.

1. *Vulgaris*. A. antennis tredecim-nodiis, frontis foveâ infertæ; abdominis petiolo elongato biarticulato, alis æquali.
2. *Affinis*. A. antennis tredecim-nodiis, frontis foveâ infertæ; abdominis petiolo uniarticulato; alis corpore brevioribus.
3. *Hirsuta*. A. antennis tredecim-nodiis; abdominis petiolo uniarticulato brevi; alis corpus æquantibus.
4. *Argentea*. A. antennis quatuordecim-nodiis; abdominis petiolo uniarticulato; alis corpore brevioribus (*c*).

(*b*) In *Apis* the antennæ of the males are filiform, while those of the other sex are sub-clavate.

(*c*) This genus, as far as I am acquainted with the species that compose it, offers to the Entomologist the singular felicity of forming a *Diagnosis Specierum*, from form, and the number and proportion of parts, without the necessity of having recourse either to pubescence, or colour, for that purpose.

I. *AMMOPHILA vulgaris*.*Common Sandwasp.*

A. antennis tredecim-nodiis, frontis foveâ insertæ; abdominis petiolo elongato biarticulato, alis æquali.

Sphex fabulosa, nigra, hirta; abdominis petiolo biarticulato; segmento secundo tertioque ferrugineis.

Linn. Syst. Nat. ed. Gmel. i. p. v. n. 1.

Fn. Suec. 1648.

Fab. Ent. Syst. Em. ii. Sphex n. 1.

Villars Ent. Eur. iii. n. 1.

Scop. Carn. n. 770.

Schrank Enum. Inf. Aust. n. 768.

Müll. Linn. Nat. cl. v. p. 864.

Faun. Fridr. 627.

Ichneumon niger, abdomine fulvo, posticè nigro, petiolo longissimo.

Geoffr. Hist. ab. des Inf. ii. p. 349. n. 63.

Guespe Ichneumon noire, à antennes filiformes, et à filet fort long, dont le devant du ventre est roux, et les ailes fort courtes.

De Geer ii. ptie ii. p. 822. n. 5. tab. 28. fig. 7.

Frisch. Inf. ii. tab. 1. fig. 6, 7.

Sulz. Inf. tab. 19. fig. 120.

Schaff. Icon. tab. 83. fig. 1.

Donovan iii. tab. 93. fig. 1.

Habitat in terrâ fabulosâ, "*aprica*;" ubi canis instar pedibus anterioribus cuniculum fodit, larvamque phalænæ, vel araneam semimortuam in eo sepelit, cui ovulum concredit: quo facto orificium terra claudit. *Linnaeus.*

Caput punctulatum, subvillosum villis sordidi coloris.

Thorax fordido-subvillosus, linea intermedia longitudinali exaratus; *callis* (d), puncto sub alas, et uno utrinque apud abdominis insertionem, pilis decumbentibus fericeo-argenteis ornatis. *Squamæ* nigræ (e).

Alæ subhyalinæ, apice obscuriores, nervis nigricantibus, abdomine circiter dimidio breviores, f. petiolum longitudine æquantes.

Abdomen clavatum; segmento primo filiformi nigro; secundo lineari, compresso, ferrugineo, puncto excavato utrinque notato; tertio campanulato ferrugineo; quarto nigro, basi et infernè ferrugineo; reliquis nigris.

Long. corp. lin. 10.

β Variat minor, thoracis callis, lateribus, et posticis pilis fericeis destitutis; alis unicoloribus. An sexus alter? forsan mas!

Long. corp. lin. 6.

This species, which is very common in Norfolk and Suffolk about sandy banks of a funny exposure; though rare, according to the ingenious Mr. Donovan, in the neighbourhood of London; is easily distinguished from its congeners by the elongated *petiolus* of its abdomen, and its very short wings. It may readily be known, even when flying, by the singular manner in which it carries its abdomen with the anus pointing upwards, so that it stands nearly at right-angles with that part of the thorax to which it is attached. The history of this insect is very entertaining, as may be seen in De

(d) By the *Calli* I mean two little tubercles, one on each side of the anterior part of the thorax, to be met with in most hymenopterous insects.

(e) The *Squamæ* are the minute semi-circular scales which cover and defend the root of the superior wings, one over each.

Geer (*f*), whom I shall content myself with referring to; but I cannot resist the temptation of transcribing from our great Ray, the very curious account he has given of some proceedings, of this very insect, as I suspect, which passed under his own observation. These are his words (*g*): “Junii 22. an. 1667, è maximis hujus generi vespam, speciem jam non recordor, erucam viridem seipsâ triplo majorem trahentem vidi: quam postquàm, me præsente et spectante, ad unius circiter perticæ nostræ mensuræ, i. e. $15\frac{1}{2}$ pedes, deportâisset; propè orificium cuniculi, quem sibi prius in terrâ excavaverat, deposuit: deinde pilulâ terreâ, quâ prædictum orificium obturaverat, remotâ, ipsa prius in cavernulam descendit, et post parvam inibi moram ascendit iterùm, erucamque, quam juxta foramen deposuerat, apprehendens, secum in cuniculum devehit, eâque inibi relictâ, mox rediit sola, globulisque terreis assumptis, unam post alteram in cuniculum devolvit, et per intervalla pedibus anterioribus ruspando (ut cuniculi aut canes solent) pulverem retrorsùm in foramen conjecit; idemque opus repetit cum pulvere aut pilulis alternatim, donec cuniculus penitus oppletus esset, ipsa aliquoties descendente ad terram (ut mihi videbatur) deprimendam et densandam; semel etiam atque iterùm in pinum adstantem evolante, ad resinam fortè petendam terræ conglutinandæ, et operi consolidando. Repleto foramine, et cum terræ superficie coæquato, ut aditus amplius non possit discerni, duo pini folia adjacentia assumit, et juxta cuniculi orificium deposuit, ad locum (ut verisimile est) signandum. Quis hæc non mihi miretur et stupeat? Quis hujusmodi opera meræ machinæ possit attribuere?” (*b*)

Scopoli,

(*f*) De Geer, tom. ii. p^{tie} ii. Mem. xiv.

(*g*) Raii Hist. Inf. p. 254.

(*b*) I have been informed that the ingenious Mr. Curtis has written a history of this insect,

Scopoli, as well as the great Linnæus, describes the rostrum as bivalve. I am loth to dissent from such high authorities; but I am convinced, from repeated examination, that the rostrum in this and most hymenopterous insects consists of three valves besides the tongue; two which cover its upper surface, and one that protects it beneath, to which it adheres (*i*).

I never was so fortunate as to meet with the variety of this insect mentioned by Linnæus, *abdominis dorso nigro*. It is possibly a distinct species. Villars, the ingenious author of the *Entomologia Europæa*, mentions another, *pedibus quatuor anticis fulvis*. I should likewise think this more than a variety.

2. AMMOPHILA *affinis*.

Contiguous Sandwasp.

A. antennis tredecim-nodiis, frontis foveâ infertæ; abdominis petiolo uniarticulato; alis corpore brevioribus.

Habitat rarior in ericetorum fabulosis.

Caput punctatum, nigro subvillosum. *Maxillæ* nigræ fasciâ mediâ fuscâ.

Thorax nitidus, punctatus, lineolis quinque (quarum una intermedia) impressus. *Squammæ* fuscæ, posticæ rufæ.

Alæ testaceæ, abdomine tertiâ parte breviores.

Abdomen (petiolo excluso) lanceolatum; segmento primo filiformi nigro, secundo campanulato nigro, apice ferrugineo; proximis duobus ferrugineis; reliquis nigris.

Long. corp. lin. 9.

insect, which was composed for a Society of which he was a member, before the Linnæan was established; what comes from the pen of so learned and accurate a Naturalist, must be extremely valuable, and therefore I cannot help indulging a wish that the public may be put in possession of this curious and interesting paper.

(*i*) Tab. xix. No. i. ii. iii. iv. v. fig. 1, 2.

I took

I took two specimens of this insect upon the sunny bank of a sand-pit in Martlesham Heath near Woodbridge, in the beginning of last September, which was the only time I ever met with it. It is sufficiently distinguished from the *A. vulgaris*, by the uniarticulate stalk of its abdomen, the black villi that are scattered over its head and trunk, the five impressed lines that are visible upon the disk of its thorax, and by its wings, which are proportionably longer, and of a different hue: the maxillæ also are shorter, and have an obscure reddish brown fascia across their middle; and the whole insect is thicker in proportion. I do not find this species described in any author that I have an opportunity of consulting.

3. AMMOPHILA hirsuta.

Hairy Sandwasp.

A. antennis tredecim-nodiis; abdominis petiolo uniarticulato brevi; alis corpus æquantibus.

Sphex arenaria hirta nigra, abdominis petiolo uniarticulato, segmento secundo tertioque rufis; alis longitudine corporis.

Fab. Ent. Syst. Em. ii. n. 2.

Linn. Syst. Nat. ed. Gmel. i. p. v. Sphex 22.

Villars Ent. Eur. iii. — — — 7.

Sphex hirsuta nigra, capite thoraceque pubescentibus, abdomine anticè fulvo.—*Scop. Ent. Car.* n. 772.

— nigra hirta, abdominis petiolo uniarticulato; abdomine medio ferrugineo; tibiis omnibus spinosis.

Schrank Enum. Inf. Aust. n. 769.

Linn. Syst. Nat. ed. Gmel. i. p. v. n. 53.

Villars Ent. Eur. iii. n. 16.

Capta semel in fossæ ripâ fabulosâ.

Caput

Caput magnum, punctulatum, atro-villosum. *Maxillæ* longitudine capitis valdè minaces. *Frons* planiuscula.

Thorax et pectus atro-villosa. *Squamæ* nigræ.

Alæ longitudine corporis subhyalinæ, apice nigræ, venis ferrugineis, costâ fuscâ.

Abdomen nigrum, lanceolato-ovatum; petiolo brevi villoso; segmento secundo, tertio, quartique basi, rubello-ferrugineis.

Pedes postici, abdomine dimidio longiores. *Tarsi* fetis valdè asperi.

Long. corp. lin. 8.—Alt. Sex? lin. $6\frac{1}{2}$.

The larger specimen of this insect I purchased, as English, at a shop in Piccadilly; but the small one (which I believe to be the male) I took upon the sunny bank of a sandy ditch near Martlesham Heath, at the same time with *A. affinis*. I think that I have likewise seen it in the rich cabinet of our Secretary, my tutor in Entomology, and to whose liberality mine is indebted for some of its most valuable contents.

This insect is beyond a doubt the *Sphex arenaria* of Fabricius, and likewise the *S. hirsuta* of Scopoli and Schrank; although Gmelin and Villars make them different. It is clearly distinct from the two preceding species. Its wings of the length of the body, tipped with a black *nebula*; its abdomen of a figure inclining to ovate; its large head very villose, as well as its trunk; its maxillæ threatening with an immense acumen, plainly prove this. It is larger also in all its parts; the band which furrounds its abdomen is of a brighter red; the legs are much more bristly, especially the tarsi; and the interior spine, which arms the apex of each of the posterior tibiæ, is more conspicuously pectinated.

4. *AMMOPHILA argentea*.*Silver-fronted Sandwasp.*

A. antennis quatuordecim-nodiis ; abdominis petiolo uniarticulato ; alis corpore brevioribus.

Caput nigro-villosum. *Maxillæ* acumine fusco. *Antennæ* thoracis ferè longitudine. *Frons* planiuscula, infrà antennis pilis densis decumbentibus argenteo-nitidissimis, nisi à tergo vix conspicuis, tecta.

Thorax angustus ; subvillosus uti pectus villis certo situ argenteis. *Squamæ* nigræ.

Alæ subhyalinæ, apice obscuriores, nervis ferrugineis ; abdomine dimidio ferè breviores.

Abdomen clavatum, segmento primo filiformi nigro ; secundo campanulato tertioque rufis ; quarto rufo, apice nigro ; reliquis nigris.

Pedes fetulis brevibus asperi.

Long. corp. lin. $5\frac{2}{3}$.

Semèl capta, sed ubi et quando nescio.

At first sight one would take this species for *A. vulgaris* β , but upon a nearer inspection it will be found very distinct. The front has no *fovea*, and from the antennæ downwards is quite covered with a coat of silver pile, which, when the light falls upon it from above, gives it a very glittering appearance. From the midst of this pile other longer black hairs, thinly scattered, arise. The antennæ consist of fourteen joints, counting the minute one at their base. The *villi* of the trunk glitter in certain lights, but not so much as the pile on the front : the footstalk of the abdomen consists of a
single

single joint, its belt is of a paler red, and the bristles of the legs are very short.

I have subjoined a sketch which exhibits a comparative view of the *rostra* and *maxillæ* in *Ammophila*, *Sphex*, *Vespa*, and *Apis*; which will, I hope, though rudely executed, (for I cannot say "*anch' io son pittore*,") afford a tolerable idea of the marks and characters that separate these genera.

I have no doubt of there being several foreign insects, besides *A. ichneumonea*, that belong to this genus (*k*): but as I have not at present an opportunity of examining the rich cabinets in the metropolis, I must defer saying any thing upon them till a future opportunity.

EXPLANATION OF TAB. XIX.

No. I.

The rostrum, maxilla, and other parts of an *Ammophila* magnified.

Fig. 1. The outside of one of the upper valves of the rostrum, which is semisagittate. (a) Its feeler of six joints.

Fig. 2. The under-side of the rostrum exhibiting (a) the inside of one of the upper valves. (b) Its feeler. (c) The under valve. (d) Its arista. (e) One of its feelers of four joints. (f) The tongue.

Fig. 3. The under-side of the tongue viewed by itself, exhibiting (a) its bifid *clava*. (b) The orifice of its tube. (c) Its stalk.

Fig. 4. The under-side of the head, to shew the direction of the rostrum when at rest. (a) The apex of the rostrum. (b) The neck.

(*k*) The insect figured by De Geer, Tab. xxxii. fig. 17. belongs probably to this genus.

Fig. 5. A maxilla. (a) The inner tooth, generally acute. (b) The intermediate one, truncated. (c) The exterior one, acuminate. This acumen, crossing that of the other maxilla, forms the forceps.

Fig. 6. The antennæ, consisting of thirteen joints. (a) The first joint. (b) The second. (c) The third.

Fig. 7. (a) The neck. (b) The back part of the head. (c) The fore part of the thorax.

Fig. 8. A hind leg. (a) The apophysis, consisting of two joints. (b) The thigh. (c) The tibia. (d) The tarsus, consisting of five joints.

Fig. 9. The first joint of the tarsus. (a) The pecten at its base.

Fig. 10. The interior pectinated spine at the apex of the posterior tibia.

No. II.

The rostrum and maxilla of a *Sphex* magnified.

Fig. 1. The outside of one of the upper valves, short and rounded, and hairy at the top. (a) Its feeler of six joints, the intermediate ones the largest.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) Its feeler. (c) The under valve. (d) Its minute aristæ. (e) Its feeler, of four joints. (f) The tongue, short and dilated at the apex.

Fig. 3. The upper side of the tongue, on which it appears rather emarginate.

Fig. 4. A maxilla.

Fig. 5. The inside of a maxilla, to shew the two obsolete teeth at the apex (a).

No. III.

The rostrum and maxilla of a *Vespa* magnified.

Fig. 1. The outside of one of the upper valves, short, hairy above the feeler, rounded at the top; below the feeler swelling out externally into the segment of a circle. (a) The feeler of six joints of nearly equal size.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) Its feeler. (c) The under valve. (d) A fovea in its disk. (e e) Two processes analogous to the arista in No. I. and No. II. but tipped on this side with a callous point. (f) One of its feelers, of four joints. (g) The tongue, obcordate and bifid. (h h) Callous points at the tip of each lobe, observable on the under side only.

Fig. 3. The upper side of the tongue, transversely striated.

Fig. 4. A maxilla. (a) Two small acute teeth. (b) One tooth large and truncated.

No. IV.

The rostrum and maxilla of an *Apis, rostro inflexo*, magnified.

Fig. 1. The outside of one of the upper valves, lanceolate with a subinvolute acumen, and laterally emarginate. (a) The feeler, consisting of a single joint.

Fig. 2. The under-side of the rostrum. (a) The inside of the upper valve. (b) The under valve. (c c) Its arista. (d d) The feelers, one at the apex of each arista, consisting of two joints. (e) Its linear tongue, subacute.

Fig. 3. The upper side of the tongue. (a) The top of it downy. (b) The lower part striated.

Fig. 4. The maxilla, armed with two obtuse teeth at its apex. (a) The interior tooth small. (b) The exterior very large. N. B. The black lines are designed to represent the *fulci*, which are drawn upon its exterior surface.

No. V.

Rostrum and maxilla of an *Apis*, *rostro reflexo*, magnified.

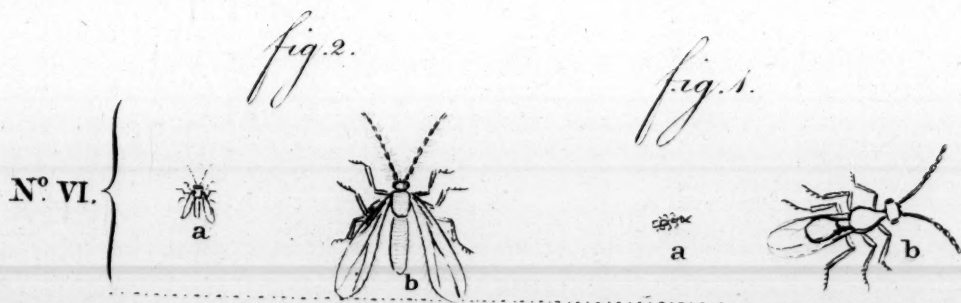
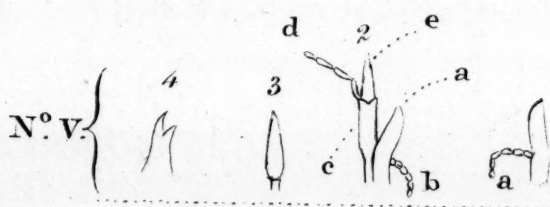
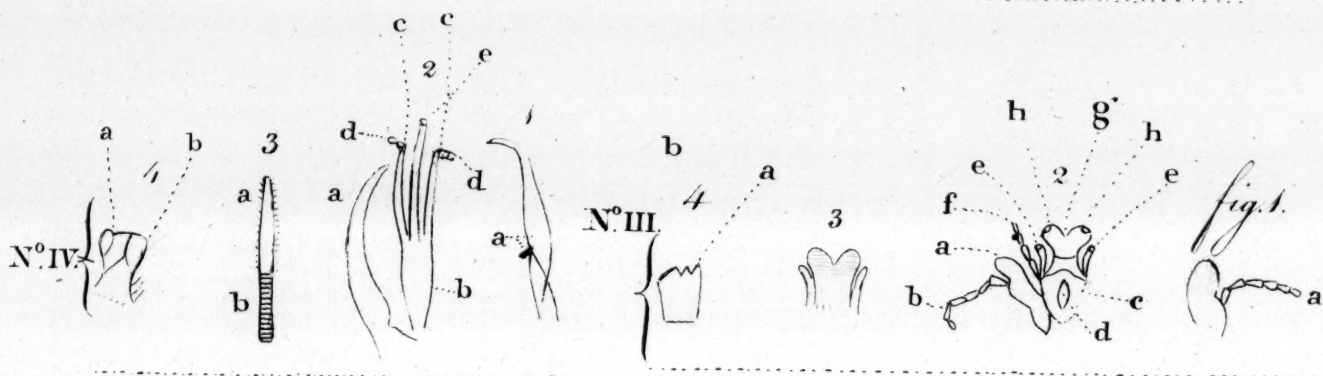
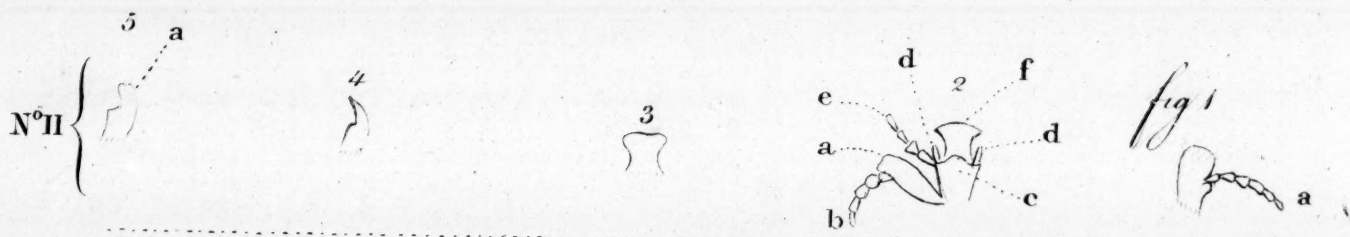
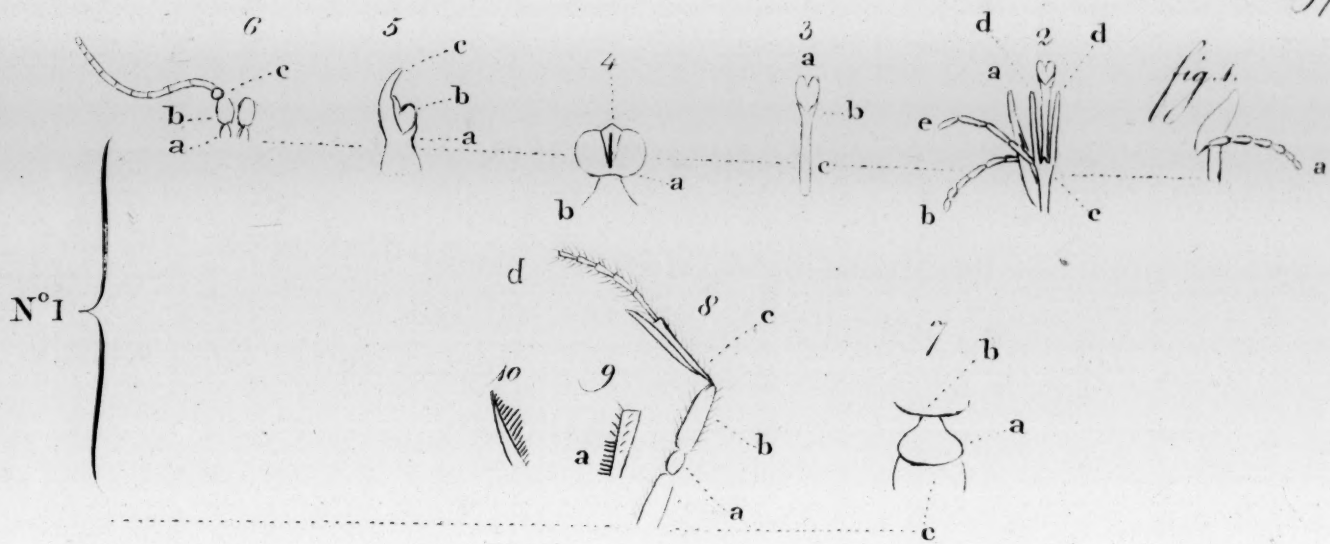
Fig. 1. Outside of one of the upper valves, cultriform and acute.
(a) Feeler of six joints.

Fig. 2. Under-side of the rostrum. (a) Inside of the upper valve.
(b) Its feeler. (c) The under valve. (d) One of its feelers of four joints, the three last forming an angle with the first (*l*). (e) The tongue.

Fig. 3. The tongue separate, linear-lanceolate, and very acute.

Fig. 4. The maxilla, armed at its apex with two unequal teeth, of which the interior is the shortest.

(*l*) With my pocket lens I could discover no part analogous to the *aristæ*, upon the under valve of this rostrum.





XVIII. *The Characters of Twenty New Genera of Plants.* By James
Edward Smith, M. D. F. R. S. P. L. S.

Read February 6, 1798.

I. HÆMODORUM.

TRIANDRIA *Monogynia*, propè Wachendorfiam.

Ord. Nat. Iridibus affine, Juss. Gen. 59.

CHAR. ESSENT. *Petala* 6, tria interiora supra medium stamini-
nifera. *Stigma* obtusum. *Capsula* infera, trilocularis.

Herba facie *Corymbii*, glabra, inflorescentiâ corymbosâ, totâ pu-
niceâ, exsiccatione nigrâ. A *Wachendorfiâ* differt germine
infero, petalis apicem versus staminiferis, staminibus abortivis
nullis.

Locus *Australasia*.

2. CONOSPERMUM.

TETRANDRIA *Monogynia*, post *Proteam*.

Ord. Nat. *Proteæ*, Juss. Gen. 78.

CHAR. ESSENT. *Calyx* nullus. *Corolla* monopetala; ringens, sta-
minifera :

minifera: *labium* superius fornicatum; inferius trifidum.
Stigma obtusum. *Semen* unicum, nudum, pappo coronatum.

Frutices rigidi, *Proteis* angustifoliis habitu affines. *Folia* simplicia, sparsa. *Flores* spicati. *Corolla* irregularis. *Stamina* faucibus inserta, ad *labium* superius adscendentia. *Antheræ* 4, uniloculares; superiores dorso connatae; laterales dimidiatae. *Semen* obconicum, pappo radiante.

Locus Australasia.

3. XYLOMELUM.

TETRANDRIA Monogynia, propè *Banksiam*.

Ord. Nat. Proteæ, *Juss. Gen.* 79.

CHAR. ESSENT. *Amenti* squama simplex. *Petala* quatuor, staminifera. *Stigma* clavatum, obtusum. *Capsula* unilocularis, disperma. *Semina* alata.

Habitus omnino *Brabeji*; gaudet verò capsulâ lignâ, apice hinc dehiscenti, seminibus binis, alatis, nec *drupâ* amygdalinâ monospermâ. *Florum* plures, stigmate minori, abortiunt.

Locus Australasia.

4. LAMBERTIA.

TETRANDRIA Monogynia.

Ord. Nat. Proteæ, *Juss. Gen.* 79.

CHAR. ESSENT. *Calyx* communis polyphyllus, imbricatus, septemflorus. *Petala* quatuor, staminifera. *Stigma* subulatum, fuscum. *Capsula* unilocularis, disperma. *Semina* marginata.

Frutex ramis virgatis, foliis ternis, apice mucronato-pungentibus.

Flores

Flores Proteæ melliferæ quodammodo similes, saturatè rosei, formosi. *Capsulæ* cristatæ, tricornes.

Locus Australasia.

In honorem amici optimi *Aylmer Bourke Lambert*, S. S. Reg. et Linn. Socii, libelli de *Cinchonâ* auctoris, hoc novum dicavi genus.

5. CONCHIUM.

TETRANDRIA Monogynia.

Ord. Nat. *Proteæ*, Juss. Gen. 79.

CHAR. ESSENT. *Calyx* nullus. *Petala* quatuor, staminifera. *Stigma* turbinatum, mucronatum. *Capsula* unilocularis, disperma. *Semina* alata.

Frutices rigidi, foliis mucronatis, pedunculis unifloris, confertis, floribus albis, capsulis obliquis. Genus a *Xylomelo* differt stigmatè mucronato, a *Banksia* fructu uniloculari, ab utrâque verò floribus calyce destitutis, nec amentaceis.

Locus Australasia.

6. PERSOONIA.

TETRANDRIA Monogynia.

Ord. Nat. *Lorantho* proximum genus.

CHAR. ESSENT. *Calyx* nullus. *Petala* quatuor, basin versus staminifera. *Glandulæ* 4 ad basin germinis. *Stigma* obtusum. *Drupa* monosperma.

Frutices subviminei. *Folia* exstipulata, plerumque alterna. *Corolla* intus glabra. *Antheræ* lineares, demum reflexæ.

Stylus.

Stylus persistens, glaber. *Drupa* in plerisque edulis. *Flores* flavescentes.

Genus a *Lorantho* discrepat numero partium, calyceque nullo.

Vix *Caprifoliis* Jussieu associandum.

Locus *Australasia*.

In memoriam celeberrimi C. H. Persoon, opusculis variis de *Fungis* præclari.

7. ZIERIA.

TETRANDRIA Monogynia, propè *Fagaram*.

Ord. Nat. Rutaceæ, Juss. Gen. 297.

CHAR. ESSENT. *Calyx* quadripartitus. *Petala* 4. *Stamina* glabra, glandulis infidentia. *Stylus* simplex. *Stigma* quadrilobum. *Capsulæ* 4, coalitæ. *Semina* arillata.

Frutices foliis oppositis, ternatis, floribus albis. Genus dignoscitur staminibus singulis glandulæ magnæ infertis.

Locus *Australasia*.

In memoriam piè defuncti *Johannis Zier*, Soc. Linn. quondam Sodalis, botanici indefessi, nobis non obliviscendi, quamvis alio sub nomine labores ejus sæpius inclaruerint.

8. LASIOPETALUM.

PENTANDRIA Monogynia, propè *Iteam*.

Ord. Nat. Ericæ, Juss. Gen. 160.

CHAR. ESSENT. *Corolla* rotata, hispida, quinquefida. *Stamina* basi squamâ munita. *Antheræ* posticè bilobæ, apice poris duobus. *Capsula* supera, trilocularis, trivalvis; dissepimentis e medio valvularum.

Planta

Planta paludosa, viminea, tomento ferrugineo stellato, præter foliorum paginam superiorem denudatam, tecta. *Folia* alterna. *Flores* racemosi, fusci, inamœni. *Calyx* 3- vel 5-phyllus. *Stylus* simplex. *Stigma* acutum. *Capsula* trigona. *Locus Australasia.*

9. CRYPTANDRA.

PENTANDRIA *Monogynia*, post *Azaleam*.

Ord. Nat. Rhododendra? *Juss. Gen.* 158.

CHAR. ESSENT. *Calyx* pentaphyllus. *Corolla* tubulosa, limbo quinquefido, squamis quinque, cucullatis, inter segmenta. *Stamina* fauce inserta sub singulis squamis. *Stigma* trifidum. *Capsula* supera, trivalvis, trilocularis e valvulis inflexis. *Semina* solitaria, compressa.

Fruticulus ericoides, foliis fasciculatis, floribus capitatis extus fetosis. *Semina* elliptica.

Locus Australasia.

10. VELLEIA.

PENTANDRIA *Monogynia*, propè *Scævolum*.

Ord. Nat. Campanulaceæ, *Juss. Gen.* 165.

CHAR. ESSENT. *Calyx* triphyllus, inferus. *Corolla* tubulosa, supra hians, limbo quinquefido. *Capsula* quadrivalvis, unilocularis, polysperma. *Semina* imbricata.

Genus *Goodeniæ* nostræ proximum, at differt *calyce* magno, *triphylo*, infero! *capsulâ* quadrivalvi, *corolla* non usque ad basin fissâ. *Stigmate* gaudet *Goodeniæ*, habitu herbaceo, acauli.

Locus Australasia.

In honorem amicissimi D. *Thomæ Velley*; Soc. Linn. Sod. fasciculo de plantis submarinis præclari.

11. STACKHOUSIA.

PENTANDRIA *Trigynia*, propè *Spatheliam*.

Ord. Nat. Terebintaceæ, *Juss. Gen.* 369.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, unguibus coalita. *Capsula* tricocca, loculis monospermis.

Fruticulus vimineus, *Struthiolæ* facie, floribus flavescentibus, racemosis, fasciculatis. *Folia* alterna, oblonga, integerrima, glaucescentia. *Styli* breves. *Stigmata* obtusa, simplicia. *Capsula* corrugata. Variat stylis binis, capsulâ dicoccâ.

Locus *Australasia*.

In honorem dignissimi viri D. *J. Stackhouse*, Soc. Linn. Sod. Nereidis Britannicæ auctoris.

12. SOWERBÆA.

HEXANDRIA *Monogynia*, antè *Allium*.

Ord. Nat. Asphodeli, *Juss. Gen.* 53.

CHAR. ESSENT. *Corolla* infera, hexapetala. *Filamenta* tria, biantherifera, sterilibus tribus interstinctis.

Herba inodora, juncea, radice fibrosa. *Scapus* nudus. *Umbella* multiflora, bracteis scariosis. *Petala* purpurea, persistencia.

Locus *Australasia*.

In honorem viri amicissimi *Jacobi Sowerby*, Soc. Linn. Sod. botanici egregii, pictoris optimi, Fungorum Britannicorum scrutatoris acerrimi.

13. XAN-

13. XANTHORRHOEA.

HEXANDRIA Monogynia, propè *Anthericum*.

Ord. Nat. Asphodeli, *Juss. Gen.* 52.

CHAR. ESSENT. *Corolla* infera, hexapetala, persistens. *Filamenta* plana, linearia, nuda. *Capsula* triquetra. *Semina* bina, compressa, marginata.

Caudex lignosus, resinâ flavâ scatens. *Folia* triquetra. *Scapus* teres, longissimus, amento terminatus multifloro, floribus abortivis interstinctis squamoso.

Locus *Australasia*.

14. CORRÆA.

OCTANDRIA Monogynia, post *Ericam*.

Ord. Nat. Rhododendra, *Juss. Gen.* 159.

CHAR. ESSENT. *Calyx* monophyllus. *Petala* quatuor, conniventia. *Antheræ* incumbentes, biloculares, longitudinalitèr dehiscentes. *Capsula* supera, quadrivalvis, quadrilocularis e valvulis inflexis. *Stigma* simplex, acutum.

Frutices foliis oppositis, simplicibus, pubescentiâ stellari, calyce campanulato, integro, denticulato, petalis in aliquibus connatis, corollam monopetalam simulantibus. *Bejaria* (meliùs *Bejaria*) Linnæi a *Corræâ* differt partium numero, at præcipuè antheris apice biporosis, stigmate incrassato septemfido.

Locus *Australasia*.

In honorem amici optimi, botanici doctissimi, *Josephi Correa*

de Serra, J U D, S S. Reg. et Linn. Sodalis, hoc novum et pulcherrimum dicavi genus, cùm *Correia* Vandellii *Ochnæ* species est.

15. GOMPHOLOBIUM.

DECANDRIA *Monogynia*, post *Sophoram*.

Ord. Nat. Leguminosæ, *Juss. Gen.* 352.

CHAR. ESSENT. *Calyx* campanulatus, simplex, quinquepartitus. *Corolla* papilionacea. *Stigma* simplex, acutum. *Legumen* ventricosum, uniloculare, polyspermum.

Frutices foliis ternatis vel impari-pinnatis, floribus magnis, flavis.

Locus *Australasia*.

16. DAVIESIA.

DECANDRIA *Monogynia*, post *Gompholobium*.

Ord. Nat. Leguminosæ, *Juss. Gen.* 352.

CHAR. ESSENT. *Calyx* angulatus, simplex, quinquefidus. *Corolla* papilionacea. *Stigma* simplex, acutum. *Legumen* compressum, monospermum.

Frutices rigidi, foliis simplicibus, pungentibus, floribus parvis, flavescentibus.

Locus *Australasia*.

In honorem clarissimi *Hugonis Davies*, S. T. P. Soc. Linn. Sod. de plantarum Britannicarum studiosis optimè meriti.

17. AFZELIA.

17. AFZELIA.

DECANDRIA *Monogynia*, propè *Hymenæam*.

Ord. Nat. Leguminosæ, *Juss. Gen.* 347.

CHAR. ESSENT. *Calyx* tubulosus, limbo quadrifido, deciduo. *Petala* quatuor, unguiculata; summo maximo. *Filamenta* duo suprema sterilia. *Legumen* multiloculare. *Semina* basi arillata. *Arbores* foliis abruptè pinnatis, alternis, floribus racemosis, sanguineis, bracteolatis, leguminibus lignosis, ponderosis, feminibus nigris arillo coccineo speciosis.

Locus *Africa æquinoctialis*.

Nomen dedi in inventoris honorem, celeberrimi *Adami Afzelii*, Botanices in Academiâ Upsalienfi Demonstratoris doctissimi, qui hujus generis historiam absolutissimam nobis pollicitus est. *Afzelia* Gmelini nimis incerta est ut tanto nomine condecoretur.

18. ERIOSTEMON.

DECANDRIA *Monogynia*, propè *Rutam*.

Ord. Nat. Rutaceæ, *Juss. Gen.* 297.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, fessilia. *Stamina* plana, ciliata; *antheris* pedicellatis, terminalibus. *Stylus* e basi germinis. *Capsulæ* quinque, coalitæ, nectario toruloso insidentes. *Semina* arillata.

Fruticuli foliis alternis, floribus solitariis. Hujus generis est *Diosma uniflora* Linnæi, cui stamina 5 abortiva sunt. Differt a *Diosmâ* defectu squamarum cum petalis alternantium; staminibus

minibus non exsertis; ciliatis, nec glabris; defectu nectarii
germen coronantis; staminumque numero.

Locus *Australasia*.

19. CROWEA.

DECANDRIA *Monogynia*, post *Eriostemonem*.

Ord. Nat. Rutaceæ, Juss. Gen. 297.

CHAR. ESSENT. *Calyx* quinquepartitus. *Petala* quinque, sessilia.
Stamina plana, subulata, pilis intertextis connexa. *Antheræ*
longitudinaliter filamentis e parte interiori adnatæ. *Stylus*
e basi germinis. *Capsulæ* quinque, coalitæ. *Semina* arillata.
Habitus præcedentis, abundè verò discrepat antherarum formâ
ac situ.

Locus *Australasia*.

In honorem amicissimi D. Jacobi Crowe, Soc. Linn. Sod. qui
Floram Britannicam ad unguem investigavit, atque observa-
tionibus numerosis vario in modo communicatis illustravit.

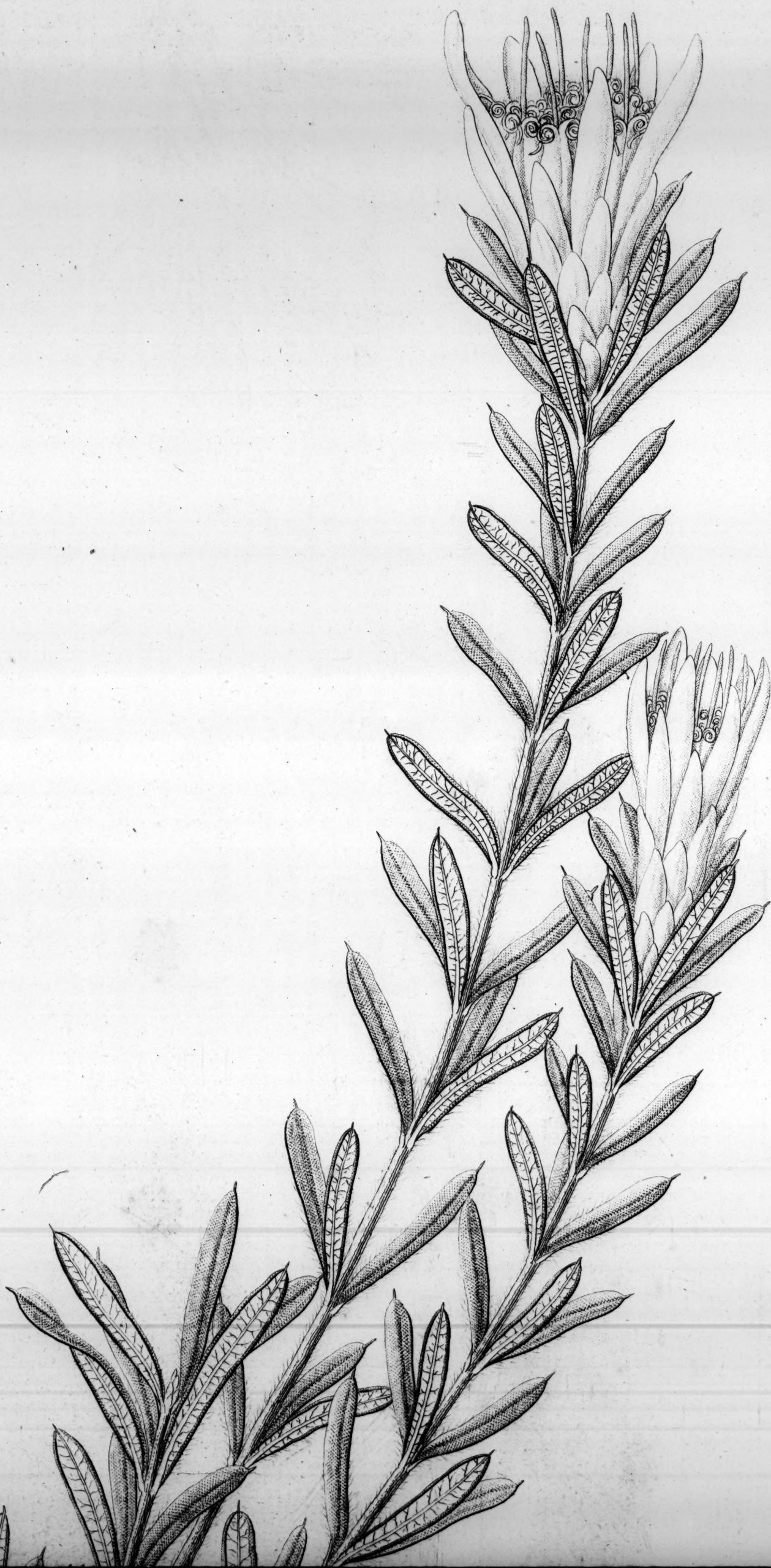
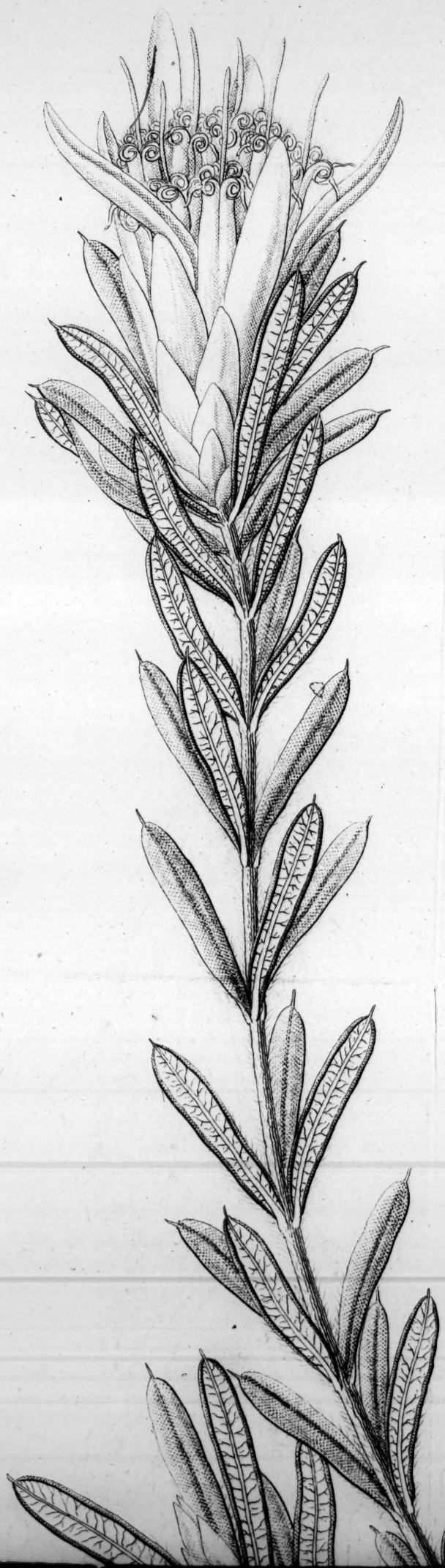
20. DIURIS.

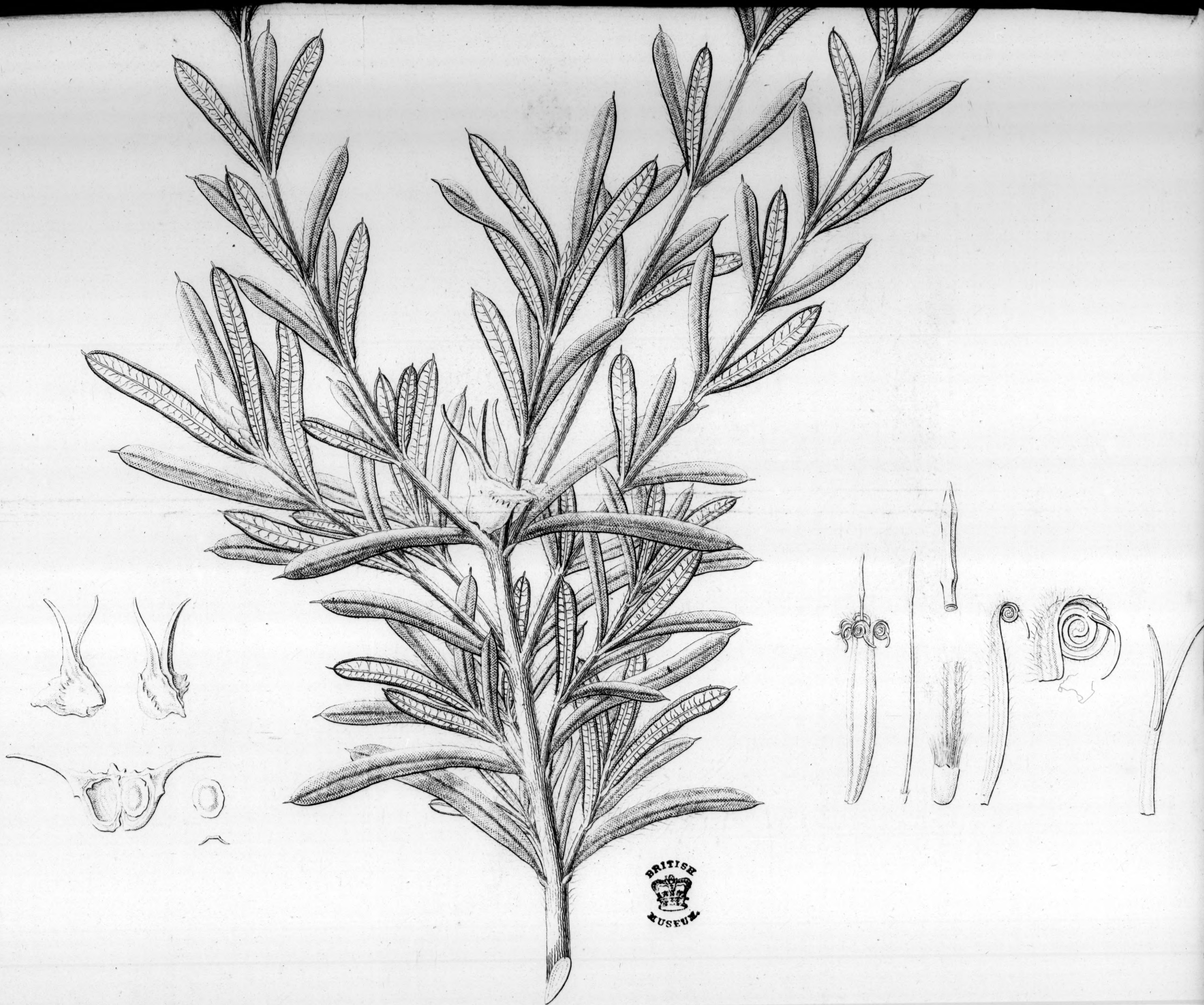
GYNANDRIA *Diandria*, propè *Arethusam*.

Ord. Nat. Orchideæ, Juss. Gen. 65.

CHAR. ESSENT. *Nectarium* dependens. *Petala* novem; quinque
exteriora maxima, biformia. *Columna genitalium* resupinata,
supernè operculata.

Formosum genus, scapo basi foliato, floribus racemosis spa-
thaceis. Dignoscitur primâ facie petalorum exteriorum
duobus





Lambertia formosa.

duobus infimis elongatis, ferè calycinis, sæpiùs linearibus. Columnâ gaudet resupinatâ, orchideis omnibus huc usque cognitis situ contrario, monente celeberrimo *Swartz*, quocum exemplaria communicavi.

Locus Australasia.

TAB. XX. exhibits the *Lambertia formosa*, the only Species hitherto discovered of that Genus, (See page 214.) engraved from a Drawing made in New South Wales, and corrected from wild Specimens.

XIX. *Further Observations on the Wheat Insect, in a Letter to the Rev. Samuel Goodenough, LL.D. F.R.S. Tr.L.S. By Thomas Marsham, Esq. Sec. L. S.*

Read February 6, 1798.

DEAR SIR,

THE very imperfect knowledge that we gained of the wheat insect in the year 1795, which through you was communicated to the *Linnæan Society*, who have honoured it with a place in the Third Volume of their *Transactions*, has stimulated me to pursue the enquiry with greater earnestness, though not with additional zeal; for it has always been my invariable opinion, that the enriching of a cabinet with the works of the creation is but a secondary consideration at best, and of little utility, unless an endeavour to investigate their nature, œconomy, and properties, be provoked by it. Indeed I often lament, that my situation in the metropolis, and the few opportunities I have of enjoying the country, prevent me from pursuing my favourite study as fervently as I could wish. In the present case I consider myself only as the first institutor of an enquiry that has become important by the persevering assiduity and accurate examination of our mutual friends, to whom I was so much indebted in the former case. Early in June 1797, I wrote both to Mr. Kirby and Mr. Markwick, requesting that they would again turn their attention to the wheat fields, and examine the ears of that grain as they advanced, from the first appearance of

of

of the flower, until the seed was ripe; and the result of their unre-mitted endeavours, with a few of my own observations, I now lay before you, requesting, that if you think them worthy their attention, you will present them to our valuable Society; for such I think it may be truly styled, since the opinion of the Public has so fully stamped its consequence.

Mr. Markwick, in a letter to me dated the 17th July 1797, states as follows:—"On the 12th of this month I first discovered some of the little flies (which I send you inclosed) sitting between the husks or clefts of the ears of wheat: the next day they appeared to me more abundant; and then, for the first time, I found a few of the small yellow larvæ, which infested the wheat in the year 1795, sitting close to the stamina, exactly as they are represented in the 3d vol. of the *Linnean Transactions*, page 251. Tab. 22. fig. 10. a; since that time I have found the larvæ in much greater abundance, and the fly is also to be seen, though I think not in such great numbers. The other insects which I have discovered on the wheat, are the *Thrips physapus*, in its larva and perfect state, as in the year 1795; and some of the ears were infested with the plant louse (*Aphis*) called here the Dolphin." On the 25th of July, I received also a letter from Mr. Kirby, that contained some valuable hints, which induced me to send a copy of it to Mr. Markwick; and on the 17th of September I was favoured with the following letter from that gentleman:—

"I want words to express the pleasure I received from your last letter, as well as from your obliging communication of that of your very ingenious and learned friend Mr. Kirby, and should have acknowledged the obligation sooner, but waited until the end of harvest, with the ill-founded hope of having something to communicate relative to our little insect worthy of your notice; for I am sorry to say,

that I have not had any success in discovering the perfect state of this insect: however, I will relate exactly what has happened.

“ I inclosed several ears of wheat, containing a number of the small yellow larvæ, in a flower-pot, closely stopped at the bottom, and covered with gauze at the top; and have at different times found dead, at the bottom of the pot, two different sorts of very small flies, one of which was a short thick black fly, with very long transparent wings, and long slender smooth antennæ, of which I have sent two rude figures somewhat magnified, see Tab. xix. No. vi. fig. 1. a and b. The other fly was as minute, if not less, with a yellow body, spotted and transparent wings, and long jointed antennæ, beset with small hairs or bristles at each joint, at least so they appeared to me through a magnifying glass; but that you may, if you please, examine them yourself, I have sent two along with the others, being all that I found of that kind, though I fear they are not in a good state; and I have also inclosed such figures as I was able to make of them, see Tab. xix. No. vi. fig. 2, a and b. To your learned friend's question as to the quantity of mischief done by this unknown fly, I fear I cannot give a satisfactory answer: I certainly think his average of two grains in each ear destroyed by this insect not too great, for I scarcely examined any ears in which there were not more than that injured. But, after all, are not our fears with respect to the injury that the wheat has received from this insect greater than they ought to be? and does not the wheat suffer as much from insects or some other cause every year, even in those years that are most productive?

“ By what I can learn from enquiries, and from my own observation, there is a good crop of wheat in this neighbourhood: one farmer, who has begun to thresh out his wheat, has found it yield well; and when in my own field I had the curiosity to rub out a few ears,
and

and to count the number of grains in each, in none I found fewer than forty, and in one sixty-two; nay, my servant found one with seventy grains, most of which were perfect, there being only three or four shrivelled in each ear—a proof, I hope, that notwithstanding the depredations of this and other insects, the crop will not turn out deficient.” In another part of his letter, Mr. Markwick, with great probability, conjectures, “that these larvæ may feed on the farina, or male dust of the stamina, and possibly prevent the proper fertilization of the pistil in such a manner as to occasion the future grain to be shrivelled and imperfect.”

In addition to the foregoing remarks, I can only subjoin a few observations of my own on the ears of wheat sent me by Mr. Markwick, and let Mr. Kirby's accurate and valuable experiments follow as a separate paper. On close examination of a number of ears, I found from two to six grains inhabited by the larvæ, as represented in Tab. 22. fig. 10. a. in the 3d vol. of the *Linnean Transactions*, except that the number of the larvæ was greater in many of them, and in one or two I found what appeared to be a pupa. Having inclosed several of those ears in large phials, with gauze over the mouth, I soon perceived that they became covered with mould, and the larvæ quitting them fell to the bottom of the phials and perished. I then procured one of the chimnies made use of for Argand's lamps, in which I inclosed some other ears, covering each end with gauze: by this means a free circulation of air being permitted to pass through, the corn remained clean, and the little animals have not quitted their situation; which leads me to conclude that they will change into the pupa state, as many appeared to have done that were left in the box in which they came, so that I have great hopes of breeding the fly at the proper season of the year, which I presume is now approaching. The figure from Mr. Markwick's drawing, represented in Tab. xix. No. vi. fig. 2. agrees in general with the description of *Tipula*

Tritici of Mr. Kirby, and perhaps may prove to be the different sex; or it is possible that Mr. Kirby might have taken his insect immediately on its quitting the pupa state, and before the wings were completely dry, so that the obsolete clouds with which they are marked had not become visible. The manner in which both these Gentlemen met with this fly leaves very little doubt in my mind of its being the true parent of the larvæ we have described; and this opinion is very much strengthened by the very great affinity there seems to be between our *Tipula* and the *Tipula Juniperina* of Linnæus, and *Tipula Pini* of the Baron De Geer, Tom. vi. p. 417. Tab. xxvi. fig. 8—19; it however differs in colour from the Latin descriptions of those insects, although it agrees in the other particulars. But the long French description which De Geer gives of *Tipula Pini*, varies very little from that of our insect; and the figure, being uncoloured, would pass for it very well, as the antennæ and wings seem exactly to correspond: even the account of the larva is nearly the same, except that he remarks a thin green line passing through the body of his, which he conjectures to proceed from the food, viz. the leaves of the pine; if this be the fact, such a line would not be visible in our larvæ, as they feed on the pollen of the wheat, which is nearly their own colour: another difference is, that the larvæ of *T. Pini* form little resinous cases to preserve themselves during the Winter; but both continue unchanged until Spring, as appears by Mr. Kirby's opening one of the cases, which he supposed contained the pupa, and finding the larva unchanged, from which I conclude that we have not yet seen the pupa. The flies of *T. Juniperina* and *T. Pini* do not come forth until May, which time will exactly suit our little animal for depositing its eggs in readiness for the blossom of the wheat; and from the appearance of some of the little cases which I have by me, that are so transparent as to admit of a perfect view of the larva, I am of opinion that they are approach-

ing to the pupa state, as the maggot becomes more white and opake, and is evidently shrunk in length. Another circumstance mentioned by the accurate De Geer, that unites them still more closely, and confirms my conjecture of the two sexes, is the difference between male and female; for he says, *Fæminæ alæ nigricantes*, agreeing with the clouded wings in our figure, and at the same time confirming Mr. Kirby's description of his. In short, so nearly are these insects allied, that I should have little hesitation to pronounce them the same, had they not fed on plants so very different in their nature and properties. The *Ichneumon Tipulæ* of Mr. Kirby has been so fully observed by all parties, that it requires nothing to be added here. I can only now observe, that the difficulty of investigating and fully exploring the secret works of the Creator must be my apology for still offering imperfect hints instead of a complete history, but I have done so with a view to excite other labourers to favour us with their communications and experiments; for, to use the words of my valuable friend Kirby, "If we can advance one step, it is something; and who can entirely remove the awful veil that conceals from mortal eyes the full beauty of the face of Nature, that envelopes in darkness her secret operations? To get now and then a glimpse of the footsteps of him who is 'wonderful in working' is all that we can expect. The united force of such observations, like rays collected by a lens, which, although when separate they operate but slightly either as light or fire, will in time illuminate a subject, and make us see clearly in what darkness we were before. To collect these separate rays is the office of the *Linnæan Society*, by whose means the light which each conveys is caught ere it be dissipated, and thus many mysteries of Nature are elucidated, which otherwise might for ever have remained in obscurity."

XX. *History of Tipula Tritici, and Ichneumon Tipulæ, with some Observations upon other Insects that attend the Wheat, in a Letter to Thomas Marsham, Esq. Sec. L. S. By the Rev. William Kirby, F. L. S.*

Read February 6, 1798.

MY DEAR FRIEND.

Barham, Sept. 29, 1797.

WHEN you left me in July last, you desired me to continue my observations upon those insects that infest the wheat; and particularly to endeavour to complete the history of the larva, of which you have given an account in the 3d vol. of the *Transactions* of the *Linnean Society* *, and which, with great justice, you suppose to be the *principal* enemy of the grain. In compliance with this request, I have endeavoured to trace it through all its metamorphoses, and to ascertain, in some measure, the quantity of mischief which it is capable of doing—with what success you shall now hear; and I shall add such other circumstances relative to this and other insects which attend the wheat, as have occurred to my observation. What I have collected, although far from being a complete history of *all* the insect infesters of that grain, may afford some few hints which may possibly be of use to assist the investigations of abler

* *Transf. Linn. Soc.* vol. iii. p. 242. Tab. xxii. fig. 9. 10. 11. 12.

Naturalists,

Naturalists, and, in conjunction with your own observations, and the information you will procure from the ingenious and accurate Mr. Markwick and other friends, be not unworthy of the notice of the public.

In the year 1795, when you first began to investigate this subject, I observed very few of the larvæ in question; and considering the *Thrips physapus* as occasioning the greatest quantity of injury, my chief attention was directed to that insect; but in the present season I have more particularly attended to the former. Wherever I have taken my walks, I have made it my business to examine those fields of wheat through which I have passed, and I have scarcely passed through any in which some florets, of every ear that I examined, were not inhabited by these larvæ; and this has often been at some distance from hence. But although I have found the larvæ so abundant, the pupa has very seldom occurred to me; so that for fifty of the former, I think I may say without exaggeration I have scarcely found one of the latter. As many as I collected, I put into a tumbler covered with gauze, in which they remained some time without any imago making its appearance. At length I observed the exuvia of one lie at the bottom of the glass; but the imago, I suppose, had made its escape through the gauze, as I could not find it. Upon this I put the remaining ones into a small phial, the mouth of which I secured with gauze four times doubled, and tied close. About three weeks since, examining this one day, I observed a small fly walking up its sides: I opened it carefully, and secured my little animal, which upon examination appeared to be a very minute *Tipula*, nearly of the colour of the pupa. It is not described in Gmelin's edition of the *Systema Naturæ*, nor by any author that I have access to; therefore I shall describe it, and the little *Ichnæumon* which deposits its egg in its larva.

TIPULA.

TIPULA. *Alis incumbentibus. Culiciformes.*

Tritici. T. ferrugineo-rufa, alis hyalinis margine pilosis, oculis nigris. Minima aurantiaca. *Antennæ* moniliformes thorace longiores. *Alæ* pilis ciliatæ. *Pedes* longiusculi.

Longitudo ferè linearis.

Larva saltatrix, apoda, citrea, marginata margine plicato-papilloso, capite acuto, caudâ truncatâ.

Habitat in *Tritici* spicis.

Pupa angusta, utrinque acuta, rufescens.

ICHNEUMON. *Minuti, abdomine ovato sessili.*

Tipulæ. I. niger, antennis basi pedibusque rufis; tibiis posticis clavatis apice nigris.

Minutissimus, niger, nitidus. *Antennæ* fractæ, vibratoriæ, articulo primo longo rufescenti. *Alæ* aveniæ immaculatæ corpore longiores. *Abdomen* obovatum, depressum, subsessile. *Tibiæ* clavatæ, præsertim posticæ.

Longitudo infra linearis.

Habitat in larvis *Tipulæ Tritici*, ovum unicum deponens in singulis.

After I had taken my little *Tipula*, I unfortunately lost it. I had fastened it upon a piece of paper with gum water, and left it for a time in an open box, that the gum might dry. I suppose some other insect took that opportunity to devour it; for when I returned to put it to a place of greater security, it was gone, and ever since I have watched in vain for the disclosure of another.

It

It is singular that this species of *Tipula*, which must necessarily be very common, should never have been noticed. So often as I have been, and at all times, in the corn-fields, with my attention always awake to entomological subjects, I do not recollect ever seeing it before. Since I lost it, I have searched for it in a field where I found the larvæ in the greatest plenty; I have examined the barn where the corn from that field was laid up; and in both instances was equally unsuccessful. From these circumstances it seems probable, that although one or two might be disclosed with me, by being placed in a situation where the sun shone upon them, sooner than their natural season, yet that in general the fly does not make its appearance until the Spring, so as to be in readiness to deposit its eggs in the wheat, when it has made so much progress in growth, that the larva may be hatched about the time of its going into blossom. And I am confirmed in this opinion by another circumstance: A few days since, with a fine needle, I carefully took off the thin membrane from two of the pupæ which I had reserved, that I might see how near they were to a change of state; but instead of discovering the lineaments of the future fly, the insect was still in the form of the larva*: so that probably the pupa is not usually complete until the Spring, and the insect incloses itself in a thin membrane to protect itself from the cold of the Winter.

I observed above, that the pupæ which I met with bore no proportion in number to the larvæ. I have seen more than once seven or eight florets in an ear inhabited by the latter, and sometimes so many as thirty in a single floret, seldom less than eight or nine, and

* It may be objected that this was probably the larva of the *Ichneumon*, which had devoured that of the *Tipula*. To this I reply, that it was in colour, form, and in every respect so exactly similar to the latter that it could be no other.

yet I have scarcely ever found more than one pupa in an ear, and had to examine several to meet with that. What then becomes of the remainder of the larvæ? Are they destroyed by that of the *Ichneumon*? or do they become the prey of some other insect? or do they fall to the ground when they assume the pupa, and remain there until the following Spring? To give a positive answer to any one of these queries I shall not pretend; I will only relate circumstances, and point out what from them appears to me to be most probable. The pupæ that I have observed have generally been somewhat attached to the grain, and, what is worthy of notice, I never found them within those florets where the larvæ had taken up their residence; they seem invariably to choose for their habitation, in their intermediate state, one where the grain is uninjured, to which they may attach themselves. A question here arises, how they contrive to get from one floret to another, having no feet? but as I have never seen them do this, I will not attempt to conjecture how they do it. In the field above-mentioned, I took up many roots of stubble, with a large lump of earth round them, to see if I could discover any of the pupæ concealed in it; but if they were there, they escaped my eye, from their minuteness: yet it seems not probable, nor analogous to the general proceedings of nature, that it should be indifferent to them whether they go under ground, or remain in the ear, when they assume the pupa. That they are destroyed by any other insect than the *Ichneumon*, I have no reason to believe, having never seen them attacked by any other; therefore it seems to me most probable that this little friend to man is the destroyer of by far the greatest part of them. If this be the case, what a benefactor to the human race is this diminutive animal! and how ought we to admire and adore the wisdom and goodness of Divine Providence, in thus setting bounds to the ravages of an insect, which, however insignificant it may

may seem at first sight, might, if permitted to exceed its due limits, deprive us of the staff of bread, and almost occasion the destruction of our species! The superstition of the Ancients, had they been acquainted with the advantages which appear to be derived to man through the instrumentality of this important though minute link in the chain of creation, would have erected altars to it, as to a beneficent deity: Can we, who enjoy the clear light of revelation, do less than adore and extol that goodness, which thus preserves a due balance in his works, and says to the destroyer, Thus far shalt thou come, and no further*? Indeed the numerous species of the genus *Ichneumon* seem to have been created on purpose to keep within due bounds the other tribes of insects. Any person who has observed the depredations committed in our gardens by the caterpillar of the cabbage butterfly, may conjecture to what extent they would be carried, were it not given in charge to the *Ichneumon* of that insect to keep them within their assigned limits. In a word, were it not for this philanthropic genus, we should not be able to stir, nor even breathe, without being annoyed, nay suffocated by myriads and myriads of troublesome animals, which are now taught to know their proper bounds, and answer the ends for which they were created. But why do I thus moralize to you, to whom these reflections are perpetually recurring? I shall therefore return to my history.

It is singular, but most people who are acquainted with the larva of the *Tipula Tritici* mistake this friendly *Ichneumon* for its parent, and thus impute all the mischief to the very creature which

* *Finis creationis telluris est gloria Dei, ex opere naturæ per hominem solum.* / *Linn.*

Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes: divitiæ felicitates humanæ. Ex harum usu bonitas creatoris; ex pulchritudine sapientia Domini; ex œconomia in conservatione, proportionem, renovationem, potentia majestatis elucet. *Id.*

is appointed to prevent it. It is some satisfaction to me to confirm your opinion* and do justice to our little benefactor, and to point out where the odium ought to fall.

To see our little *Ichneumon* deposit its egg in the caterpillar of the wheat fly, is a very entertaining sight. In order to enjoy this pleasure, I placed a number of the latter upon a sheet of white paper, at no great distance from each other, and then set an *Ichneumon* down in the midst of them. She began immediately to march about, vibrating her antennæ very briskly:—a larva was soon discovered, upon which she fixed herself, the vibratory motion of her antennæ increasing to an intense degree; then bending her body obliquely under her breast, she applied her anus to the larva, and during the insertion of her *aculeus*, and the depositing of the egg, her antennæ became perfectly still and motionless. Whilst this operation was performing, the larva appeared to feel a momentary sensation of pain, for it gave a violent wriggle. When all was finished, the little *Ichneumon* marched off to seek for a second, which was obliged to undergo the same operation, and so on to as many as it could find in which no egg had been before deposited—for it commits only a single egg to each larva. I have seen it frequently mount one which had been pricked before, but it soon discovered its mistake and left it. The size of it is so near that of the *Tipula*, that I imagine the larva of the latter could not support more than one of the former, and therefore instinct directs it to deposit only a single egg in each; besides, by this means one *Ichneumon* will destroy an infinite number of larvæ.

The larva of the *Tipula Tritici* (as Mr. Markwick, in his letter to you, dated July 17, 1797, has well conjectured) appears to feed upon

* *Transf. Linn. Soc.* vol. iii. p. 243.

the pollen or dust of the antheræ, for in those florets in which it resides the germen never swells, and the antheræ are persisting; from which it seems evident that the impregnation of the germen is prevented, either by the insect's using some means, perhaps a kind of gluten, to prevent the pollen from bursting from the antheræ, or, *vice versa*, by doing something to the stigma to prevent the fertilization of the germen. The pollen of three antheræ is a store which will maintain sometimes thirty of these creatures, from the time that the wheat is in blossom, until it is nearly if not altogether ripe. I could never discover that the grain was injured in any other way by this insect, but it invariably produces the inanition of it in the floret which it inhabits. It may always be detected by the discoloured appearance of the base of the corolla, which is its usual station.

Although Mr. Markwick could not discover any damage done to the wheat in the year 1795, yet, upon a closer examination in the present year, that gentleman seems convinced that the inanition of the grain takes place wherever the larva makes its attack, as appears by his letter above quoted. My own observations fully confirm this opinion; and the mischief occasioned by it will appear to you very considerable, at least in this neighbourhood, when you weigh the following result of a particular examination of my own, which had this circumstance for its object.

To ascertain the quantity of mischief produced by our *Tipula* within particular limits, I went to a field of fifteen acres, which was planted partly with white and partly with red wheat. In this field I took five stations, one on each side, and one in the centre. In each station I examined a certain number of ears, grain by grain, without selection. The result was, that in thirty ears of white wheat, seventy-three grains were destroyed by the larva, which is at the
rate

rate of not quite two and a half grains to an ear; and in twenty ears of red wheat, twenty-nine grains were destroyed, which is nearly at the rate of one and a half grains to an ear. Take the whole together, and the proportion will be about two grains in an ear, which I suppose may be about a twentieth part of the produce, and would make a difference of at least five coomb in the crop in this field. The white wheat in this instance was most exposed to the attack of the insect;—whether this be generally the case, must be determined by future experiments upon a more extensive scale. Least mischief seemed to be done on the South side of the North hedge; but no part escaped wholly—not an ear I examined but what had sustained some injury. From the field that I have been speaking of I went to another, which was sown later in the Autumn: in this I found scarcely any of the larvæ; but it was very much infested by the *Aphis*, called in Mr. Markwick's letter above-mentioned the Dolphin*. The same species of *Aphis* is sufficiently common upon barley and oats, as well as wheat: I found very few of these in the first field. The red gum, which is undoubtedly a kind of *Fungus*, appears to me totally unconnected with the insects that infest the wheat: in the field where I found an infinity of the larvæ of the *Tipula Tritici*, and *Thrips physapus*, I scarcely found any

* Possibly this may be the *Aphis Avenæ* of Fabricius: but as he has given no description of it, I cannot be positive; I shall therefore describe it under the name of

A. granaria, viridis, cauda bifeta, setis geniculisque pedum nigris.

Aphis avenæ. *Fab. Sp. Inf.* ii. p. 386. n. 17. *Gmel.* tom. i. part. iv. p. 2206. n. 52. *Vill. Ent. Eur.* i. p. 551. n. 50?

Caput flavidum uti antennarum articulus primus. *Oculi* nigri. *Abdomen* obovatum caudâ aculeatâ. *Pedes* lividi, tarsis geniculisque nigris.

Habitat in tritici et hordei spicis, avenæque paniculis.

florets

florets which produced this little plant ; but some ears of a kind of bearded wheat, which I cultivated in my garden, were quite discoloured by it, without any larva attending upon it. Of all the insects that are found in wheat, the *Thrips physapus*, in all its states, is by far the most numerous. I do not recollect examining a single ear in which it was not to be found ; and my opinion still remains unaltered, that it derives its nourishment from the grain ; nor can I look upon the species of this genus as carnivorous, any more than those which belong to its neighbouring genera, *Aphis*, *Chermes*, and *Coccus*.

I have nothing further at this time to add upon this interesting subject, and therefore believe me, &c.

XXI. *Account of a New Species of Muscicapa, from New South Wales.*
By Major-General Thomas Davies, F. R. S. and L. S.

Read February 6, 1798.

HAVING had the good fortune to procure fine specimens of the male and female of a singular bird from New South Wales, which the natives of that country call the *Merion Binnion*, or Casfowary-Bird, and as it is a species at present very little known, I am induced to present to the President and Members of the Linnæan Society an accurate drawing of both specimens, in hopes that it may be found worthy of their acceptance. I am sorry that I cannot at the same time furnish the Society with an accurate account of its manners. Even its genus appears to be rather difficult to determine with the certainty I could wish, and I shall therefore leave that decision to others more capable than myself. I have, as yet, classed it in my own collection with the *Flycatchers*, as it appears to me to approach nearest to that genus.

All the information which I have been able to procure respecting it, from Governor Philip, Colonel Nepean, and other Gentlemen, who resided some years in New South Wales, is, that it is found about Sidney and Botany-Bay, in marshy places, abounding with long grafs and fine rushes, in which it hides itself very dexterously ;
 that,

that, when disturbed, its flight is very short, like that of a grasshopper; and that it no sooner alights than it runs with such great agility that many who have been confident of their having covered birds with their hats, have, to their great surprise, seen them again take wing at no great distance: so that they are always difficult to catch. I have, however, to observe, that the colour of the bird, and the length of its legs, must greatly contribute to its so easily escaping the vigilance of those who pursue it. I am also induced, from the circumstance of its bill being well surrounded with bristles, to think that its food is small flies, and other insects which it catches amongst the roots of the grass and rushes.

The length of the bird, from the point of the bill to the end of the rump, is three inches; the bill is three-eighths of an inch long, of a brownish black colour, considerably curved at the point, having the base furnished with strong bristles, and nostrils large and low down; irides uncertain; head much flattened and narrow towards the base of the bill, with a pale azure bar from the base of the bill over the eye; throat, to the centre of the neck, on each side, azure; front part of the head, cheeks, breast, fore part of the shoulders, thighs, sides and rump, ferruginous; centre part of the belly nearly white; hind part of the head, neck, shoulders, back and rump, greyish brown, elegantly streaked with brownish black; feathers of the back and rump, long, soft, and of a silky texture; wings very short, scarcely reaching to the base of the tail, of a dark brownish black colour, edged with rufous brown; legs slender, three-fourths of an inch long, of a pale dun or horn colour; feet slender and long; claws crooked and very sharp, especially the hind one, which is the largest, all of the same colour with the legs; the tail, independent of the body, is four inches and more in length, shafts black and very slender, armed on each side with minute

slender filaments, like hair, of a black colour. The female is like the male in every respect, excepting that it has no azure bar over the eye, and that it is entirely of a ferruginous colour from the base of the under-mandible to the vent.

The natives of New South Wales give the name of *Merion Binnion* to this bird, on account of the great resemblance of its tail to the feathers of the Cassowary.

Since the above account was written, Dr. Shaw has examined the bird therein described, and has named and characterized it as follows :

MUSCICAPA *malachura*.

Soft-tailed Flycatcher.

M. fusca, subtus ferruginea; gula (maris?) cœrulea; cauda longa cuneata, rectricibus decompositis.

Brown Flycatcher, ferruginous beneath; the throat (of the male?) blue; the tail long and cuneated, with loose-webbed feathers.

TAB. XXI. represents the *Muscicapa malachura*, male and female.

XXII. *Obser-*

Scam. Trans. IV. tab. 21. p. 232.





XXII. *Observations on the Genus Pausus, and Description of a New Species.*

By Adam Afzelius, M. D. Demonstrator of Botany in the University of Upsala, F. R. S. and F. M. L. S.

Read March 6, 1798.

IN a dissertation published at Upsala in the year 1775, and called *Bigæ Insectorum*, Linné described two new genera of insects, to one of which he gave the name of *Paussus*. The etymology of this word, though he does not explain it himself, is probably the Greek *παῦσις*, signifying a *pause*, a *cessation*, a *rest*. But then it ought to be spelt with only one *s*; and in either case it would be difficult to comprehend the reason of his applying it to the insect in question. The former, however, may easily be accounted for as a trifling error of the press; and the latter, I imagine, it may not be improper to explain in this way:—Linné, old, infirm, and sinking under the weight of age and labour, saw no possibility of continuing any longer his glorious career: wishing therefore to put a stop to his usual amusements and useful exertions, he would say,

———— hic meta laborum;

and so it was as to insects, for *Pausus* is the last he ever described, and afterwards he published only two small botanical dissertations.

But whether this etymology and explanation be right or wrong, I cannot find any better; and thus I am induced to follow Thunberg, Gmelin, and Herbst, in their mode of spelling *Pausus* with one *s*, being as to my idea the most rational.

Linné knew but one species of this genus, from which he took the generic character, and which he called (from μικρός and κεφαλή) *micro-cephalus*, on account of its head being very small in proportion to the other parts of the body. It is shortly described in the dissertation above-mentioned, and five figures of it subjoined, representing it in different views, two in its natural size, and three in a magnified one.

After this original account of Linné, there have been very few authors that have published any thing concerning *Pausus*. Those I have had an opportunity of seeing, and I think I have seen all, are the following; and whose writings I shall mention in the same chronological order as they have appeared.

Thunberg, during his travels in the country of the Hotentots, in the year 1772, having met with two unknown insects, described them as constituting a new genus in the class of Coleoptera. But having returned to Sweden, and being then acquainted with the *Pausus* of Linné, he thought his two species might be referred to this genus, established during his absence; and accordingly he wrote a paper on the subject, which he delivered to the Royal Academy of Science at Stockholm, and which is printed in its Transactions for the year 1781.—Here he describes and specifies his two insects, calling the one *Pausus ruber*, and the other *Pausus lineatus*; annexing two figures of the last mentioned, one shewing it in its natural size, and the other representing it magnified. He also makes some few additional remarks on the genus itself, and gives the specific difference of *P. microcephalus*.

Fuesly,

Fuefsly, without taking notice of what Thunberg had written on the subject, republished Linné's original account in the 3d number of his *Archiv der Insektengeschichte*, printed at Zurich 1783. The whole description, as well as all the figures, are expressly copied; but the other remarks are translated into the German language.

Gmelin, in his *Linnaei Systema Naturæ* of 1788, seems to have confined himself only to the perusal of the text of Fuefsly, transcribing even his error; which he surely could never have done, had he at the same time consulted the original of Linné.

Herbst, in his *Natur System der Insekten*, the 4th part of the Coleoptera, published at Berlin 1792, has inserted both Linné's and Thunberg's species, but translated their descriptions of them into German, and given them new specific characters in Latin, though not very recommendable for correctness either scientific or typographical. To this he has subjoined a plate, representing, amongst many other insects, also two figures of *P. microcephalus*, and two of *P. lineatus*; the former copied from the dissertation of Linné, and the latter from Thunberg's paper in the Transactions of the Swedish Academy of Science.

Fabricius began in the same year, or 1792, to publish at Copenhagen his *Entomologia Systematica*. Not having before taken notice of *Pausus* in any of his writings, he now introduced it in this work; not however as a distinct genus, but putting it under his *Cerocoma*, he calls Linné's insect *C. microcephala*, and the figured one of Thunberg *C. lineata*. The other, or *Pausus ruber*, he does not mention at all.

An anonymous author, or probably more than one, have lastly published at Winterthour in the canton of Zurich, in the year 1794, a French translation of Fuefsly, combining all his separate numbers in one continued volume, and calling it *Archives de l'Histoire des Insectes*

Insectes de Fuesly. Here occurs nothing but what is found in the original edition, except a new blunder, and a remark in the notes to this purport: "that there are two other species of *Pausus* mentioned in the memoirs of the Swedish Academy, and that Fabricius, not having examined these insects as minutely as he ought, has placed them amongst his *Cerocomæ*, till there may occur an opportunity of determining their genus with more accuracy."

These are all the writers I have seen who treat on the genus and species of *Pausus*. And it is very remarkable, that almost every one of them has committed some mistake. This may be excusable, when there are several accounts of a natural production from ocular observations of different persons; but not so when there exists only one, as is the case in regard to Linné's *Pausus*; for though Thunberg and Fabricius may both have seen it, yet neither of them has added any thing to illustrate it but what might have been collected from Linné's description and figures of it, the latter having only created greater confusion than any before him, by putting it among the *Cerocomæ*. As to Fuesly, Gmelin, Herbst, and Fuesly's translators, I am almost certain they never saw a *Pausus*; and therefore, whatever they have written, they ought to have taken from Linné, and are to be esteemed in proportion as they have copied him faithfully.—But I shall state their respective mistakes more at large, when I come to the history of *P. microcephalus* in particular, and shall now in the first place settle the characteristics of the genus.

Besides the Linnæan species, which I have examined here in London, I brought another nondescript with me from Africa, which, in imitation of Linné's deriving the specific name of his from the Greek, I call (from σφαίρα and κέρας) *P. sphærocerus*, on account of each of its antennæ bearing at its end a large and remarkable globe.

Both

Both these species I have carefully compared, and found to agree in many circumstances; but I shall here only mention the most striking ones, as well as those which stand in need of some explanation, or where, from want of proper *termini technici*, I shall be under the necessity of using circumlocution in order to be understood.

The *Body* is hairless, smooth, and polished, above somewhat depressed, before narrower, and behind nearly cylindrical; the *size* small, being from the top of the antennæ to the end of the abdomen only three lines long, and across the elytra not quite one broad; the *colour* uniform, a darker or lighter brown; the *motion* steady and slow, at least in the species I have seen alive. It is very unlike all other genera I know; but it seems to come nearest to the *Clerus* of Fabricius, bearing to it, at least upon the whole, so much natural resemblance that its most proper place in the systematical arrangement will be next after that genus.

The *Head* is smaller and shorter than the thorax, almost round, and at the base surrounded as it were by an annular segment; in the living animal it is pointing straight forward, but when dead it commonly bends a little downwards. The *clypeus* is minute, and more or less depressed in the middle. On the *throat* there is a convex spot, raised in form of a triangle, which is nearly equilateral, the base of which forms a cross-bar between the eyes, its two upper angles being acute, but the lowermost cut off by the annular segment just mentioned.

The *Eyes* are rather large, transversally oblong, prominent, and situated in a socket, the brim of which is elongated into one angle before lying horizontally, and another behind standing upright; which structure seems to prevent the insect from being able to look in any other direction than forwards.

The

The *Antennæ* are very remarkable, and different from those of all other insects, not only by their consisting of no more than two joints, but also by their singular mechanism. The *under-joint* is a thick and almost round knob, truncated at both ends, and below on the outside furnished with a little bright ball, moving in a cavity on the head, just before the eye, between the clypeus and the anterior angle of the eye-socket. This ball is the pivot on which the whole antenna rolls or performs its rotatory motion. It is very visible at its root, and easily mistaken for an eye, being quite globular, and, by continual rubbing, highly polished. The *upper joint* is also a kind of knob, but of a very different nature, and curiously constructed. In the front it is outwardly marked with a raised line, or an edge, running from the base to the vertex, and behind elongated into a tube or a hook pointing inwards. Beneath it is furnished with a pedicle, which having a ball at the end, and being inserted in the under-joint, towards the outside of its top, as into a socket, makes the upper-joint qualified for a separate motion, independent of that of the whole antenna. And as a proof that this is really the case, it is to be observed that there are scarcely two antennæ to be met with having the elongated hind part of the upper-joint pointing exactly the same way, though the under-joint remains in its usual position; which makes it very difficult to determine the true and most natural direction of this hind part, which however, I should think, must be either just above the under-joint, or a little on the outside of it. Linné gives to this part the name of *hook*; and so it is in my species, but in his own it resembles more a tube or a blunt spur, or rather it is nothing else than a short contracted elongation of the upper-joint. But, having made this remark by way of explanation, I shall not scruple to retain the original term *uncinata*, as applied to the upper-joint, called by Linné

Linné *clava*, to which I also would add his other appellation of *solida*, if it could be done with any sort of propriety. By this epithet he certainly meant nothing more than *integer*, adopting it in contradistinction to *lamellatus* and *perfoliatus*. And it answered the purpose very well, as long as no other insects were known than those having their clavæ entire and at the same time solid. But now it would imply a contradiction, since we have got a coleopterous insect with an entire clava though not solid; which is undoubtedly the case as to *P. sphærocerus*, being provided with clavæ, or head-balls, almost pellucid, and seemingly containing no substance whatsoever but perhaps some fine liquid. As to the clavæ of *P. microcephalus* I am not so certain, but they have also an appearance of being inflated; and besides, as they are larger than the whole head, one would suppose them too heavy to be carried in the front, if quite solid. However this may be, the word is still improper in regard to the other species, and I shall therefore avoid using it. The under-joints of both species are almost parallel, but the upper ones very diverging. On the vertex of these latter, at the end of the raised line above described, there are one or more small protuberances, tipped with fleshy substances, like hairs, which probably are organs for feeling.

The *Mouth*, and its different parts, as to their shape and structure, I have not been able to ascertain so accurately as I could wish, and as it ought to be done; for, independent of their smallness in so little an animal, it is quite impossible to describe them rightly, without their being taken separate from one another; and for this purpose I had not any of these rare insects to sacrifice, three of one species and six of the other being all which I have seen. Besides, the former were not my own; the latter I could subject to a closer scrutiny, not minding much whether any of them became broken. The

consequence of which is, that I am better acquainted with *P. sphærocerus* than with the other. The mouth, however, of both species, and the various parts belonging to it, I have been obliged to examine in their unseparated state, and I have been therefore unable to avoid all mistakes, as the innermost are more or less concealed by the exterior ones. But I must confess that even these latter, which I can plainly see through a compound microscope, do not appear to me exactly such as Fabricius will have them to be. I shall describe them all as I have found them.

The *Palpi* are four in number, and seem all to arise from the cross-line between the eyes, or the base of the jugular triangle before mentioned. The two placed in the middle and farther in, and perhaps also a little higher up, are three times as long as the others, at the bottom nearly approximate but afterwards diverging, flat within and convex without, moving on two small tubercles at the base, above which they are first contracted, and so more or less widened. They may also, although my observations have not satisfied me on the subject, be in some way or other attached to the lowermost and external part of the labium. In those of *P. microcephalus* I cannot find the least vestige of articulation except the base-hinges; but those of *P. sphærocerus* seem to be jointed all along, though I cannot ascertain it as a fact, not being able to make out any number of joints, even with the greatest magnifying power which I have used. These palpi would probably be called *posteriores* or *postici* by Fabricius, but the appellation of *interiores* appears to me much more suitable. The other two, which he perhaps would name *anteriores* or *antici*, answer every description of being *exteriores*, for they are not only placed on the outside of the interior ones, and close to them, but also on the outer margin of the often mentioned guttural cross-bar. They are, besides, very small, erect, compressed,

compressed, narrower towards the top and blunt, and seem to have neither joints nor motion, nor the same structure as the others, being minutely punctated. Whether or not they internally adhere to the maxillæ, is impossible for me to decide; but certain it is, that if they do, it cannot be to any other part than their very bases.

The *Mandibula*, also inserted in the jugular cross-line between the exterior palpi and the anterior angle of the eye-socket, extended to the middle of the under-joint of the antennæ, and, moving on two hinges below, are upon the whole arched, acuminate, and forcipated: but, to speak more particularly, they consist of three different parts, viz. two horny cases or sheaths, the inferior of which is the largest and almost straight; the superior narrower, shorter, and bending inwards; and from the top of this there comes out a still narrower round and fleshy hook, which meets that of the other mandibula, and seems to be a true instrument for feeling. The structure of the lowermost sheath being the broadest, and the other broader than the hook, makes the mandibulæ appear as drawn out below on the inside, and as if furnished with two teeth, the inferior of which is covered with small hairs.

The *Maxillæ* being hidden by the mandibulæ, the exterior palpi and the labium, I cannot see any thing of them but their very tops, which are extended above the lip, or between it and the mandibulæ, and appear to be arched, horny, cylindrical, toothless, sharp-pointed and forcipated.

The *Labium* is rather large, thin and membranaceous, of equal length and breadth, longitudinally raised in the middle, entire at the top, and there furnished with hairs. It is besides shorter than the interior palpi, and often covered by them, which then are placed one on each side of the longitudinal carina. That of *P. sphaerocerus*

is nearly truncated, and downwards inflected; but that of *P. microcephalus* shews an appearance very different, its top being seemingly drawn out in the middle into a point, and its keel longitudinally sulcated, as if the lip were bipartite. Whether these appearances are optic illusions, or realities, or owing to the subjacent maxillæ, I do not pretend to determine. But so much is certain, that, by repeated observations, I have not been able to discover any fissure in the middle tip of the labium, viewed in front.

The *Thorax*, though very unlike in these species as to many particulars, is nevertheless upon the whole of the same shape. It is narrower than the elytra, and uneven, consisting of two distinct parts, the foremost a little raised all around, and the other not only lower, but also broader, and either depressed or excavated in the middle, being otherwise nearly cylindraceous; and therefore the term *attenuatus*, used by Thunberg, seems not to be very apposite, though it may answer much better the description of his own species. But even supposing that the thorax tapers towards the base, it would be the very reverse of *attenuatus* as applied elsewhere.

The *Elytra* are linear, almost flat, smooth, thin and flexible; the base, containing the small *scutellum*, is not only much contracted, but even narrower than the thorax; the exterior margins, bent down, cover a great deal of the abdomen; and the truncated ends are inflected behind; but to avoid a fold being necessary in the outer angle on each side, where the incurvated borders of the sides and the ends meet, the elytra are there cut out into minute sinuses, the edges of which being a little raised form as it were small oblong tubercles.

The *Abdomen* is of the same thickness throughout, and composed of five segments; *above*, it is nearly flat, and of a light changeable ferruginous

ferruginous colour, looking as if pellucid, and the posterior margin of the last segment but one as if raised above the terminal, which is dark-coloured, very large and bent down, being behind circular and marginated; *underneath*, and on its fore-part, the abdomen is marked with a little convex plat situated between the second and third pair of feet, and further towards the end it is gibbous, the first and the fourth of the segments being much broader than the others, and the cavity under the thighs of the hinder feet surrounded by a circle of very minute and approximated dots. In the specimens of *P. microcephalus* which I have had to examine, this cavity being covered by the thighs, and the upper part of the abdomen by the elytra, I can see only very few of the dots; nor am I able to ascertain whether the whole back of the abdomen is as light-coloured as that of *P. sphaerocerus*.

The *Feet* are all nearly of an equal length, the two first being inserted in the fore-part of the thorax, or rather of the breast; the two second in the base of the venter at the top or contracted end of the little plat above mentioned; and the two last in the middle of the venter. The *thighs* are thicker than the legs, particularly those of the hinder feet; they are without hairs or spines, of an oblong shape, but more contracted at the base, and compressed, though at the same time gibbous on both sides; they are moveable in a transverse direction by aid of a light-coloured appendage, which being attached to their base within, rolls in a socket below, and which on the hinder feet is very large, oval, and compressed to an obtuse edge, but on all the other feet it resembles more a tubercle, being almost round; the thighs are lastly cut out at the top, and their inner margins a little beyond the middle, for the inward motion and contraction of the *legs*, which also are compressed but not gibbous, and on the edges more or less furnished with short hairs.

hairs. The *tarsi* are nearly cylindraceous and very slender, composed of four joints, three of which are of equal length, but the outermost longer, all marked at their tops with a hair on each side, and otherwise hardly distinguishable. At the end of the *tarsi* there are two longish claws, crooked inwards, and diverging.

From this generic description it is very easy to be convinced that *Pausus* never can be of the same genus as *Cerocoma*. And it is rather a matter of surprize that Fabricius, who always has been ready to divide the genera of Linné, and sometimes has done it for reasons, I fear, not very urgent, should now unite two so strikingly and essentially distinct. He says, it is true, "that he has only put it in here for future examination, that it seems to be a genus of itself, and that he does not know it rightly." But then it might perhaps have been as well not to have mentioned it at all. Be this however as it may, in order to prevent any farther misconception on the subject, I will here state all the principal circumstances by which *Cerocoma* differs from *Pausus*.

The *Body* is of an oblong shape, and almost of an equal breadth throughout, the head and the thorax being scarcely narrower than the elytra. It is found without the tropics in the South of Europe and the most Northern parts of Africa, on plants growing in open fields.

The *Head* is oval, and inflected downwards.

The *Antennæ* are small, scarcely as long as the thorax, and composed of many joints of various size and shape, particularly those of the male. And therefore I do not comprehend what could induce Fabricius to call the joints equal, and the antennæ moniliformes, especially as he adds that the latter are *irregulares*; for this term, according to the signification he has attached to it himself, flatly contradicts the former assertions.

The

The *Palpi* are nearly of equal length, the anterior affixed to the back of the maxillæ, and the posterior to the middle of the lip, the former consisting of four joints and the latter of three. Fabricius says, that the palpi are filiform, and all their joints cylindrical, and of the same size. This may be true as to the hinder palpi, but it is not equally so in regard to the foremost, as these latter have the middle joints vesicular and incrassated in the male, and obconical with the terminal one much larger in the female.

The *Mandibulæ* are toothless and without sheaths.

The *Lip* is cylindraceous, elongated, and contracted where the palpi are inserted, and above them bifid.

The *Thorax* is flat, but marked with no inequalities, being neither depressed nor excavated.

The *Elytra* are rounded at the end, and neither bent down there, nor at the exterior margins.

The *Abdomen* is furnished on the sides with papillary folds.

The *Tarsi* of the fore feet have five joints, but those of the hinder feet only four.

These few remarks may be sufficient to shew that *Cerocoma* is as different a genus from *Pausus* as can be supposed, and perhaps much more so than many which Fabricius has established. Having thus far settled the generic character, I shall now proceed to the history and description of the species in particular.

I. *PAUSUS microcephalus*.

This, Linné says, "was sent to him by Dr. Fothergill of London, in a collection of insects chiefly from North America and Guinea;" which in fact is nothing more than saying, that it may be a native
of

of either of those countries, or of both, or of neither; in one word, that its *habitat* was not known to him; and therefore he very prudently avoided assigning to it any.—This being the case, it is quite unaccountable how Fuefsly, Gmelin, Herbst and Fuefsly's translators could do it, without supposing a misrepresentation of Linné's text, as I am certain they knew nothing of the insect, but what they had learned from his dissertation.

Fuefsly tells us, "it was found amongst a number of other insects which the celebrated Dr. Fothergill of London had gathered in North America." But neither was Dr. Fothergill ever in America, nor is this insect a native of that country, as far at least as we yet know. This double blunder has nevertheless been faithfully transcribed by Herbst; but Gmelin has satisfied himself with only the wrong *habitat*. Fuefsly's translators have made two alterations in his text; the one equally erroneous as the original, in saying that this species was found in a collection of insects from South America and the other; a real amendment, in excluding the statement of Dr. Fothergill's having collected it himself in America.

Thunberg has very properly not attempted to say from whence it came; but Fabricius mentions Africa, from the authority of the cabinet of the Right Hon. Sir Joseph Banks, Bart. K. B. and I have no doubt but that this is its true native country; not however the whole continent of Africa, but its western coast, within the Tropics, on this side of the Line; at least it is certain that the two specimens of it now in London, one belonging to Sir J. Banks, and the other to Mr. Drury, were both sent from thence by Mr. Smeathman. And it is so much the more probable that the insect Linné got, likewise came from him; for I understand he was particularly patronized by Dr. Fothergill, and amongst other curiosities also sent him many insects from that part of Africa which he visited.

Now I find from those of his manuscript papers which Mr. Drury obligingly has permitted me to peruse, that though he often travelled to different places between Isles de Los and Sherbro', still he resided chiefly at the Bananas;—and therefore I think we shall not be much mistaken, if we consider this island, or the adjacent part of Sierra Leone, as the only native country hitherto known of *P. microcephalus*, this rare insect, of which there are no more to my knowledge now existing in Europe than the three specimens before-mentioned, all of which I have seen, but in a very different manner; for, of the Linnæan one, now in the possession of Dr. Smith at Norwich, I had only a cursory view, at a time when I entertained no idea of describing it; but the other two I have been allowed to examine and compare carefully. And as the figures annexed to Linné's dissertation, though upon the whole of merit, were found to be capable of conveying a wrong notion of the true structure of the antennæ, and principally of their superior joint; Sir J. Banks did me the favour of granting me leave to have his specimen drawn in different sizes and positions.

Linné describes this insect as *niger elytris piceis*, Thunberg and Gmelin as *totus niger*, and Fabricius as *fuscus*. Herbst calls it *ater*, but figures the elytra piceous, and the rest of the body blackish-cinereous; and thus makes it very curiously resemble an harlequin. As to Fuesly, he has only copied Linné's words; but in the French edition both *niger* and *piceus* are translated by *noire*.—Hence we find that this insect has been described now with one colour and now with another, and sometimes as having two colours, though it does not possess but one, and that almost uniform. This is a singular fact, and a striking instance of authors not knowing the true signification of Linné's terms.

It is not very uncommon in our days to see *ater* and *niger*, *piceus* and *fuscus*, used promiscuously: but it was not so originally with Linné; for, by *ater* he meant a colour of the blackest kind; by *niger*, another of black and brown mixed together; and by *piceus*, still another of a lighter cast, or with a greater portion of brown. As to *fuscus*, it was a dark colour, composed of a mixture of black, brown, and cinereous. Having once asked him the difference between *ater* and *niger*, I received this explanation from himself. It must therefore be genuine; and if we apply it to the present case, we shall find it agree admirably well, for the colour of *P. microcephalus* is a dark brown, but underneath and on the forepart bordering on blackish; and of course Thunberg has approached very near the truth in calling it *niger*, though I would rather give it the name of *piceus*.

Fabricius, in pointing out the specific difference of this insect, and speaking particularly of its antennæ, says that their clava is *irregularis*. This word not being otherwise defined, it must here be taken in the sense in which it is commonly used, and then it conveys the idea of the clava being of a shape either not always uniform, or deviating from the ordinary rules of nature. But neither is the case, for all that I have seen have been quite alike, and an oblong spheroid is not a very uncommon form to be met with in nature; *P. sphærocerus*, both the *Pausi* of Thunberg, and *Cerocoma ruficollis* of Fabricius, having, besides something similar to it, the upper joint of their antennæ differently shaped from those of other insects.

After these details of the history of *P. microcephalus*, I shall now state the chief differences between it and *P. sphærocerus*.

It is of the same length, but somewhat broader across the elytra, and of a much darker colour, being also very little shining.

The

The *Head* is uncommonly small and without a horn, its annular base-part higher than the foremost; the *clypeus* bipartite, and the jugular *triangle* minute.

The *Eyes*, being as dark as the surrounding parts, cannot be discovered but by a large magnifier, and then they appear to be of a water-colour. The angles of the brim of the socket are large, the hinder one being raised to the height of the eye.

The *Pivots* of the *antennæ* are black, very bright, and easily taken for eyes. The *under-joint* is furnished with a wart on the inner margin of the top, covered with papillary or cartilaginous hairs. The *upper-joint*, or the *clava*, is dotted, much greater than the head, and of the shape of an oblong spheroid, being in *front* rounded and compressed with the carina raised into a sharp edge, provided on the *vertex* with four tubercles set in a row and tipped with hairs, and elongated *behind* into an obtuse tube, laterally compressed, above depressed, and underneath having a knob, which, in moving, touches the bundle of hairs on the top of the under-joint. The *pedicle* is long and crooked, its upper part being broader, compressed, and keeled in front.

The *interior Palpi* are of a lanceolated-oblong shape, and furnished with very minute hinges.

The *Mandibulæ* have small hinges, and the inferior sheath much larger than the superior.

The *Thorax* is broader than the head and very uneven, the two parts being entirely separated by a transversely surrounding furrow, the *foremost* above and on the sides elevated to a sharp edge like a collar, and the *hinder* one cut out in the middle into a cavity, which, obtuse behind, and dilatated and deepened before, is encompassed on the sides with diverging and outwardly declining lobes, being

at their top rounded, and provided with shining hairs of a fulvous colour, and incurved downwards.

The *Elytra* are without dots, and rather longer than the abdomen. The folds of the exterior borders, and the tubercles on the outer angles of the ends, are both larger than those of *P. sphaerocerus*.

The *Under-wings* are quite footy, and without the least glossiness.

The *Abdomen* has the terminal segment very retuse, and the margin of the next before it visibly raised.

The *Hinder-feet* are a little shorter than the others. The *thighs* of these feet are larger than those of *P. sphaerocerus*. The *legs* of the four foremost feet are linear, but those of the two hindmost ones nearly lanceolated, being also somewhat broader. The joints of the *tarsi* are exceedingly difficult to be distinguished.

2. PAUSUS *sphaerocerus*.

I had been in Africa almost three years before I happened to meet with this remarkable little insect, and then it was quite accidentally. There was a house building for the Governor, on an eminence called Thornton-hill, at the South end of Freetown, in Sierra Leone; and in the beginning of the year 1796, several apartments having been got ready so as to be habitable, one of them was allotted to me, and I removed into it in the end of the month of January.

I had not resided there many days, when one evening having just lighted my candle and begun to write, I observed something dropping down from the ceiling before me upon the table; which, from its singular appearance, attracted my peculiar attention. It remained for a little while quite immovable, as if stunned or frightened, but began soon to crawl very slowly and steadily. I then caught it, and, from the remembrance I had of the Linnæan species, I directly took it for a non-descript of this genus.

Some few days after, coming into my room from supper with a light in my hand, and having put it upon the table, there instantly fell another down from the ceiling. The third I was favoured with by the then Governor, Mr. Dawes, who informed me that it had dropt down before him on the table, just when he had entered his room and was going to write. The other three which I afterwards collected, were also got upon similar occasions; and from thence I thought I had some reason to conclude, that it is a nocturnal animal, that it becomes benumbed by candle light, that it lives in wood and prefers new built houses, &c. After the end of February I never saw any more.

The last which I caught I put into a box, and left confined there for a day or two. One evening going to look at it, and happening by chance to stand between the light and the box, so that my shadow fell upon the insect, I observed, to my great astonishment, the globes of the antennæ, like two lanthorns, spreading a dim phosphoric light. This singular phenomenon roused my curiosity, and, after having examined it several times that night, I resolved to repeat my researches the following day. But the animal, being exhausted, died before the morning, and the light disappeared. And afterwards, not being able to find any more specimens, I was prevented from ascertaining the fact by reiterated experiments at different times; which I therefore must recommend to other Naturalists, who may have an opportunity of visiting Sierra Leone, requesting that they would particularly inquire into this curious circumstance.

I shall now only add some few remarks, shewing in what manner this new species most essentially differs from the old one.

Not being quite so broad, it looks as if it were longer, and more cylindrical.

cylindrical. It is also of a lighter or chestnut colour, and all over very glossy.

The *Head* is larger, but its annular base part smaller and contracted. It is furnished with a little horn in the middle between the eyes, which is straight, conic, and tipped with a tuft of cartilaginous hairs. The *clypeus* is only depressed, and the jugular *triangle* wider.

The *Eyes* are large and very evident, those of the male black, though in a certain light appearing greenish; but those of the female are like pearls, or as if they were covered with a crystalline membrane. The angles of the brim of the socket are small and rounded at the top, and the hinder one lower than the eye.

The *Pivots* of the *antennæ* are not so discernible, being of the same colour as the surrounding parts. The *under-joint* is without any hairy papilla or wart. The *upper-joint*, or the clava, is of the size of the head, quite globular, and resembles an inflated bladder, being almost pellucid, and of a light flesh colour. The *keel* is nothing more than a raised line, finishing on the vertex in only one chestnut brown tubercle covered with cartilaginous hairs. Behind there is a little conical shining *hook*, of the same colour and with the same sort of hairs bending outwardly, being of equal length with the horn on the head, but narrower. The *pedicle* is short, straight and cylindraceous.

The *interior Palpi*, furnished with very visible hinges, are a little thicker towards the top, but look in some directions as if they were filiform.

The *Mandibulæ* have large hinges, and the superior sheath almost as long as the inferior one, and nearly cylindrical.

The *Thorax* is of the same breadth as the head, and not very uneven, the two parts being separated by a furrow only on the
sides

sides and underneath, the *foremost* above and on the sides convex resembling an annular segment, and the *hinder* one impressed in the middle with a mark somewhat like two small diverging wings of a blackish silvery colour.

The *Elytra* are shorter than the abdomen, and minutely punctated.

The *Under-wings* are of a shining and changeable violaceous colour, and not very dark.

The *Abdomen* has the terminal segment a little convex, and in the female more so than in the male. Underneath, the third and last segments are darker than the others.

The *Feet* are all of equal length. The *thighs* have smaller appendages than those of *P. microcephalus*. The *legs* are at the top broader, truncated and hairy, having the exterior margin drawn out into a sharp lamina, on each side of which there is a row of small diverging hairs, which make the leg appear as if it were canaliculated, at least in a certain light, and with a small magnifier. On the interior margin there is but one row of hairs, and on the hinder legs I do not observe any. The *tarsi* are longer than those of *P. microcephalus*, and have also both the joints and the claws much more distinct.

Having thus given a sufficiently detailed account of the genus *Pausus*, and its two species, which I have seen myself, as to their history, their generic resemblance, and specific difference, I shall now endeavour to describe them in a shorter and more scientific language.

In settling his genera of insects, Linné attended chiefly to the *antennæ* and their structure; but he took occasionally into consideration also other parts, as the *head*, the *thorax*, the *elytra*, &c. &c. Fabricius has adopted a different method, and made out the generic

descriptions only from the mouth and the organs for feeding, or what he calls *Instrumenta cibaria*. These descriptions he has published in his *Genera Insectorum*, under the name of *Characteres naturales*, in imitation of what Linné had done before in regard to plants.

But as a *Character naturalis*, in whatever manner it may be made out, does not contain the whole description of a genus, or the whole account of the agreement between its species, I would call the remaining part *Habitus naturalis*, and from the leading points of this double statement I would form a *Character artificialis*, to be put before the genus in the text of the book, leaving what is named *Character essentialis*, or the most distinguishing marks from other genera, out of *Character naturalis*, to be inserted as usual in the methodical arrangement at the head of the class.

But *Pausus* is a genus so very unlike all others hitherto known, that I cannot find a place for it in this arrangement. Gmelin has put it in the division, *Antennis clava solida*; and Fabricius with *Cerocoma* in another, *Antennis moniliformibus*. But, as I have proved above, it does not belong to either; nor can it be placed amongst Fabricius's genera *Antennis extrorsum crassioribus*, because these expressions, without being otherwise defined, are so vague that they may be equally applied to all insects with clavated antennæ, as it has been done not only by Linné, but also by Fabricius himself in his *Philosophia Entomologica*. I am therefore under the necessity of making a new division for *Pausus*.

DESCRIPTIO

DESCRIPTIO GENERIS.

CHARACTER ESSENTIALIS.

***** *Antennis clava integra inflata.*

PAUSUS. *Antennæ* biarticulatæ, clava uncinata pedicellata mobili.

CHARACTER ARTIFICIALIS.

PAUSUS. *Antennæ* biarticulatæ, articulo superiore maximo inflato uncinato pedicellato: pedicello in cavitate articuli inferioris mobili.

Caput porrectum: gula triangulo convexo instructa.

Thorax angustus inæqualis scutellatus.

Elytra flexilia deflexa truncata.

Pedes antici pectoris parti anticæ affixi: femoribus appendiculatis: tarsis quadriarticulatis.

CHARACTER NATURALIS.

Palpi quatuor inæquales obtusi, basi trianguli gularis affixi.

interiores medii, triplo longiores, divergentes, intus plani extra convexi, basi biarticulati, interius paulòque altius collocati.

exteriores laterales, minuti, erecti, fetacei, compressi, articulis destituti, margini exteriori baseos trianguli gularis inferti.

Mandibulæ porrectæ arcuatæ acuminatæ forcipatæ, basi biarticulatæ, dein e vaginis duabus corneis introrsum dilatatis truncatis, quarum infera latior, bidenticulatæ, et tandem hamulo vaginis angustiore cylindraceo carneo terminatæ.

Maxillæ apice teretes integerrimæ unguiculatæ forcipatæ.

Labium palpis interioribus brevius, subquadratum, membranaceum, carinatum, apice integrum ciliatum.

Antennæ biarticulatæ: articulo *inferiore* parvo subrotundo utrinque truncato; *superiore* maximo inflato in *capitulum* integrum, ante et extraversus carinatum: carina a basi ad verticem tuberculatum ducta, ponè et introrsum tubo vel hamulo instructum, et subtus pedicellatum: pedicello basi globoso nitidissimo: globo cavitati articuli inferioris versus marginem ejus apicis exteriorem inferto, et ad superiorem articulum rotandum accommodato.

Metamorphosis et victus nondum innotuerunt.

HABITUS NATURALIS.

Animal parvum, ab apice antennarum ad finem abdominis tres circiter lineas longum et transversim per elytra vix unam latum, supra depressum, in parte antica angustius, qua posteriora fermè cylindraceum, læve glabrum unicolor nitidulum tardigradum, Africam occidentalem inter Tropicos sitam inhabitans.

Caput parvum, thorace multò minus breviusque, subrotundum, porrectum, basi quasi annulo cinctum. *Clypeus* minutus. *Gula* triangulo elato convexo: basi inter oculos ducta.

Oculi majusculi laterales transversè oblongi prominuli: margine acetabulorum antico in angulum horizontalem, postico in perpendicularem producto; unde facultas videndi non nisi in partem anticam.

Antennæ: articulis inferioribus ferè parallelis, superioribus valdè divergentibus, mobiles ope tuberculi oculum referentis globosi

bofi nitidissimi, quod margini exteriori baseos articuli inferioris affixum, in cavitate capitis ante oculos inter angulum eorum acetabuli anticum et clypeum rotatur.

Thorax partibus duabus distinctis inæqualibus: *antica* dorso emarginata altiore et lateribus etiam paulò magis dilatata, *postica* latiore, dorso prorsum depresso vel excavata, cæterum cylindracea, constans angustus scutellatus: *scutello* minuto triangulari.

Elytra linearia planiuscula tenuia flexilia: *basi* scutellum continente valdè coarctata, etiam thorace paulò angustiora; *humeris* utrinque antrorsum aliquantum protuberantia; *marginē* exteriorē longitudinaliter quasi carinata et dein adeò deflexa ut latera abdominis tota tegant, plica in anticum latiore; *futuris* parum marginata; *apice* truncata inflexa et angulo exteriorē, ubi partes deflexæ laterales et terminales concurrunt, excisa in sinum minutum, cujus margines elevati veluti tubercula compressa apparent.

Abdomen lineare: segmentis quinque, *supra* planiusculum, colore dilutè ferrugineo vario: segmento ultimo maximo deflexo obscuro ponè rotundato marginato; *subtus* in antica parte inter pedes medios et ultimos lamina convexa notatum, poneversus gibbum: segmentis primo et quarto majoribus, ponè femora pedum posticorum depresso: fossula circulo e punctis minutis approximatis confecto circumdata.

Pedes subæquales, antici pectoris parti anticæ, medii ad basin ventris et postici illi medio inserti. *Femora* inermia, lanceolato-oblonga, compresso-gibbosa, incrassata præsertim pedum posticorum, ut tibiæ extendi atque contrahi possint apice margineque interiorē ultra medium canaliculata, et ut pedes toti introrsum moveri queant basi appendiculata: appendice

pallidiore, acetabulo subjacenti adaptata, pedum posteriorum maxima ovali in aciem obtusam compressa, reliquorum parva subrotunda. *Tibiae* compressae, margine utroque pilis brevissimis insignitae. *Tarsi* angusti teretiusculi 4-articulati unguiculati: articulis minutis, tribus aequalibus, ultimo longiore, apice utrinque pilo instructis, alias vix discernendis: unguibus duobus longiusculis apice incurvatis divergentibus.

DIFFERT A CEROCOMA.

Habitatione æquinoctiali in domibus.

Corpore glabro, antico angustiore.

Capite porrecto, gula triangulo notata.

Antennis magnis biarticulatis: articulo superiore maximo, uncinato, pedicellato, mobili.

Palpis basi trianguli jugularis affixis, interioribus multò longioribus.

Mandibulis vaginatis denticulatis.

Labio subquadrato, carinato, integro.

Thorace angusto inæquali: partibus duabus distinctis.

Elytris margine circumcirca deflexis, apice sinuatis truncatis.

Abdomine plicis papillisque lateralibus destituto.

Pedibus anticis anticæ pectoris parti affixis, femoribus appendiculatis, tarsis omnibus quadriarticulatis.

DESCRIPTIO SPECIERUM.

1. *PAUSUS microcephalus*, capite mutico, clava oblongo-sphæroidea, elytris longitudine abdominis impunctatis, tibiis linearibus.

Paussus microcephalus, Linn. *Diff. Big. Insect.* p. 6. sq.* Tab. ann. fig. 6—10. *Fuesl. Arch. Insect.* Plag. 3. p. 1. sq.* Tab. 13. *ed. Gall.* p. 42.* Tab. 13.

Pausus

Pausus microcephalus, totus niger, *Thunb. Act. Stockholm*, 1781. p. 170.

Pausus microcephalus, *Gmel. Syst. Nat.* Tom. 1. P. 4. p. 1737.*

Pausus microcephalus, ater capite minutissimo, thorace angusto depresso, elytra picea lævia inflexa tenuia (tenuia): *Herbst. Syst. Insect. Coleopt.* P. 4. p. 100. sq.* Tab. 39. fig. 6. a. b.

Cerocoma microcephala, antennis biarticulatis: clava irregulari dentata maxima, corpore fusco, *Fabr. Entom. Syst.* Tom. 1. P. 2. p. 82.

Habitat in Infula Bananas ejusque vicinitate. Mus. Banks, Smith, & Drury.

Piceus in parte antica et infera paullo obscurior, supra parùm subtus magis nitidus.

Caput minutissimum muticum: parte postica annulari altiore, *clypeo* bipartito, *triangulo* jugulari minuto.

Oculi mediocres, sed adeo obscuri, ut distingui nequeant nisi lente valdè aucti, et tum saturatæ glaucescentes apparent: *angulis* acetabulorum magnis, postico oculis ferè altiore.

Antennæ: tuberculo ad basin *motatorio* nigro nitidissimo, speciem oculi omninò præ se ferente; articulo *inferiore* obsoletè punctato, apicisque margine superiore introrsum verruca pilosa instructo; *superiore* caput magnitudine excedente, oblongo-sphæroideo, punctato, *antè* compressiusculo: carina in aciem acutam elevata, *vertice* denticulis quatuor piliferis in feriem carina paulò exteriorem adinstar cristulæ dispositis notato, *ponè* in tubum obtusum supra depressum subter tuberculatum apice compressum super articulum inferiorem producto, *subiùs* pedicello longo adscendente supernè compresso et antè carinato, infernè angustiore tereti nigro.

Palpi interiores lanceolato-oblongi: articulis minutis.

Mandibulæ:

Mandibulæ : articulis parvis ; vagina inferiore superiorem magnitudine multum excedente.

Labium : carina fulcata et apice medio quasi mucronato.

Thorax capite multo latior et maxime inæqualis : *partibus* duabus fulco transverso circumcirca ambiente omnino distinctis ; *antica* supernè et lateribus in aciem acutam elevata, collari vel rotulam referente ; *postica apice* utrimque rotundata pilisque fulvis nitidissimis deorsum inflexis insignita, *medio* in fossulam prorsum excurrentem dilatatam profundiore excavata, *lateribus* extrinsecus declivi, *poneversus* margine convexo terminata.

Scutellum acutiusculum, reliquo corpore nitidius.

Elytra longitudine abdominis vel ferè longiora, punctis destituta : deflexu laterali latiore et marginibus futurarum sinubusque tuberculatis in angulo apicis exteriori multo majoribus atque evidentioribus quam insequentis speciei.

Alæ inferiores fuliginosæ et omni nitore expertes.

Abdomen retusum : margine postico segmenti penultimi elato ; subtus ponè pedes colore in cupreum vergente.

Pedes obsoletè punctati, postici aliquantò breviores. *Femora* pedum posticorum margine exteriori arcuata. *Tibiæ* apice muticæ lineares, pedum posticorum paulò latiores ferè lanceolatae. *Tarsi* graciles : articulis difficillimè distinguendis.

2. *PAUSUS sphaerocerus*, capite cornuto, clava globosa, elytris abdomine brevioribus punctatis, tibiis apice dilatatis.

Habitat in Sierra Leone : Freetown. Mus. Smith, Marsham et meum. Januario et Februario noctuabundus ambulat, luce admissa cæcutit, delabitur et aliquamdiu immobilis remanet. Globi antennarum phosphori videntur, atque materia tenui liquida repleti.

Castaneus

Castaneus nitidissimus, præcedente paulò angustior, unde etiam longior apparet et magis cylindræus.

Caput majus cornutum: *parte* postica annulari minore coarctata; *cornu* medio parvo conico erecto pilis cartilagineis terminato; *clypeo* solum depresso; *triangulo* jugulari majusculo.

Oculi admodum magni, valdè conspicui, atri, sed in certa quadam luce virescente tincti: *angulis* acetabulorum parvis apice rotundatis, postico oculis multò humiliore.

Antennæ: tuberculo ad basin *motatorio* concolore, et sic non adeo manifesto; articulo *inferiore* punctis atque verruca destituto; *superiore* magnitudine capitis, sphaerico, vesicæ inflatæ simili, semipellucido, incarnato, *carina* minuta vertice tuberculo unico pilifero castaneo nitido terminata instructo, *ponè* in hamulum conicum, longitudine cornu capitis sed graciliorem, apice pilis in externum flexis notatum, castaneum nitidissimum paulum extra articulum inferiorem producto, *subtus* pedicello brevi cylindræo atro.

Palpi interiores versùs apicem aliquantum incrassati, sed certo aspectu cylindræi: articulis majusculis.

Mandibulæ: articulis magnis; vagina superiore parum brevior, et fermè cylindræa.

Labium apice deflexum et ferè truncatum: *carina* fulco destituta.

Thorax latitudine capitis et parum inæqualis: *partibus* duabus fulco non nisi lateribus et subtus exarato distinctis; *antica* supernè et lateribus convexa, annulum vel segmentum referente; *postica* margine *anteriori* signo medio depresso nigrescenti-glaucò duabus alis minutis apice divergentibus non adeo dissimili impressa, *posteriore* parum elevata sed spatio lato: stria transversa media, instructa.

Scutellum obtusiusculum ferè inconspicuum.

Elytra abdomine breviora, obsoletè punctata.

Alæ inferiores colore violaceo vario nitido.

Abdomen apice convexiusculum nigrum; subtus segmentis tertio et ultimo nigrescentibus obsoletissimè punctatis.

Pedes omnes æquales impunctati. *Femora* basi atra: appendicibus minoribus quam *P. microcephali*. *Tibiæ* basi nigricantes, versùs apicem latiores compressiores, ipso apice pilum utrinque gerentes, truncatæ, margine exteriori serie pilorum duplici, interiore unica et pedum posticorum nulla instructæ. *Tarsi* longiores quam præcedentis speciei: articulis etiam multò evidentioribus unguibusque majoribus.

Fæmina differt *oculis* crystallinis; *palpis* interioribus paulò angustioribus, exterioribus glaucescentibus; *mandibulis* brevioribus: vagina infera angustiore; *scutello* minore; *abdomine* longiore, apice convexo piceo; *femoribus* pedum posticorum aliquantò gracilioribus; cæterum simillima.

To these insects, now described, there are some others which seem to be nearly related; but whether they are exactly of the same genus I cannot determine, not knowing how far they agree in the particulars of the generic character as above stated. But that they may not be overlooked hereafter, I shall here insert them. They are the three following:

1. *Pausus ruber*: totus rufescens, *Thunb. Act. Stockb.* 1781. p. 170.*

Pausus ruber, totus rufescens, thorace anticè eroso; elytra truncata, margine exteriori deflexa, *Herbst. Syst. Insect. Coleopt.* P. 4. p. 101.*

Habitat in Capite Bonæ Spei.

2. *Pausus lineatus*: rufescens linea elytrorum fusca, *Thunb. Act. Stockb.* 1781. p. 171.* Tab. 3. fig. 4. 5.

Pausus

Pausus lineatus, capite collo cylindrico a capite (thorace) separato; elytra linearia, linea in medio lata fusca, *Herbst. Syst. Insect. Coleopt.* P. 4. p. 102.* Tab. 39. fig. 7. a. b.

Cerocoma lineata, antennis biarticulatis: clava elongata integra, fusca linea nigra, *Fabr. Ent. Syst.* Tom. i. P. 2. p. 82. sq.

Habitat in Capite Bonæ Spei.

3. *Cerocoma ruficollis*, antennis biarticulatis: clava elongata integra, nigra thorace elytrorumque striga ferrugineis, *Fabr. Ent. Syst.* Tom. i. P. 2. p. 83.*

Habitat - - - - Dom. Lund.

Before I conclude, I must recommend to Gentlemen who may have an opportunity of seeing *P. microcephalus* and *P. sphærocerus* alive, to investigate their nature and metamorphoses, to examine carefully their instruments for feeding, and to enquire into the interior structure of the upper-joints, or the clavæ of their antennæ, as well as into the peculiar quality of giving light, which the balls of *P. sphærocerus* seem to possess, &c. &c.

EXPLANATION OF TAB. XXII.

PAUSUS microcephalus.

Fig. 1. the natural size.

Fig. 2. magnified, seen from above.

aa. the four tubercles on the vertex of each of the clavæ or upper-joints of the antennæ.

bb. the hooks of the clavæ, with their interior knob.

c. the pedicles of the same, with their balls at the base.

d. the lower joints of the antennæ.

ee. the eyes.

f. the raised hinder part of the head.

g. the elevated fore-part of the thorax.

Fig. 3. one of the tubercles of the clava, tipped with hairs, greatly magnified.

Fig. 4. the head, seen below, also much magnified.

a. the raised edge of the clava.

b. the hairy warts on the top of the lower joints of the antennæ.

c. the tops of the maxillæ.

d. the labium.

ee. the eyes.

ff. the jugular triangle.

Fig. 5. greatly magnified.

a. the mandibulæ, with their teeth and hinges.

b. the exterior palpi.

c. the interior ones, with their hinges.

PAUSUS sphaerocerus.

Fig. 1. the natural size.

a. the horn on the head.

Fig. 2. magnified, seen from above.

aa. the tubercles on the vertex of the clava or upper-joint of the antennæ.

bb. the eyes.

cc. the contracted hinder-part of the head.

dd. the elevated fore-part of the thorax.

ee. the raised posterior margin of the segment next to the terminal one.

Fig.



Fig. 1.



Fig. 2.

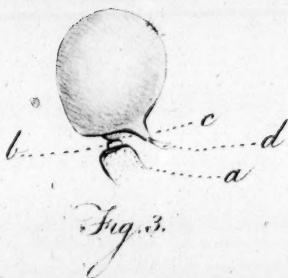


Fig. 3.



Fig. 4.

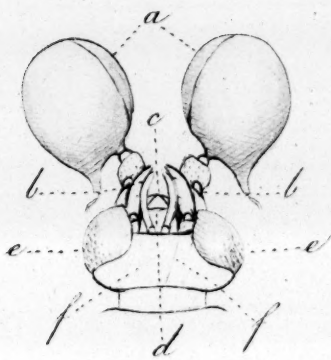


Fig. 5.

Pausus spærocerus.



Fig. 1.

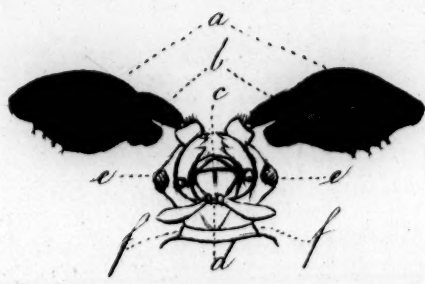


Fig. 4.



Fig. 5.



Fig. 2.

Pausus microcephalus



Fig. 3. one of the antennæ, greatly magnified.

a. the lower-joint.

b. the hook of the upper one, or of the clava.

c. its pedicle.

d. the ball of this pedicle.

Fig. 4. the hairy tubercle of the clava, very much magnified.

Fig. 5. the head, seen below, also greatly magnified.

a. the raised line of the clava.

bb. the balls or pivots of the whole antenna.

c. the tops of the maxillæ.

d. the labium.

ee. the eyes.

ff. the jugular triangle.

Fig. 6. greatly magnified.

a. the mandibulæ, with their hinges.

b. the exterior palpi.

c. the interior ones, with their hinges.

XXIII. *Observations on the British Species of Bromus, with Introductory Remarks on the Composition of a Flora Britannica.* By James Edward Smith, M.D. F.R.S. P.L.S.

Read April 3, 1798.

WHEN I first found myself in possession of the herbarium, manuscripts, and library of Linnæus, several great objects presented themselves to my view, all tending to the advancement of that study to which I then, in my own mind at least, entirely devoted myself. The establishment of a Linnæan Society, and the elucidation of the plants of Great Britain, were among these objects. The success of the former, from the concurrence of talents and zeal with which it has been supported, has exceeded my most sanguine hopes: happy will it be if the other object, the attainment of which must necessarily depend more on time and personal application, should ever be as completely accomplished.

Considering the attention that has already been given to British plants, it would appear that the subject must be nearly exhausted, and that nothing could be more easy than to compile a perfect catalogue of them; such slight errors in nomenclature as already exist, being at once to be removed by turning to the Linnæan herbarium. Perhaps this might be the case if we had fewer publica-
tions

tions upon the subject already. It is in many instances easier to detect truth itself, than to trace the causes of error.

Dr. Merrett, in his *Pinax*, must be considered as the father of our indigenous botany, notwithstanding the errors of that work are such that Ray has called it "Dr. Merrett's bungling *Pinax*." It may be questioned, however, whether any of us, who presume upon a higher degree of estimation as Naturalists, if landed on an unexplored country, with only such helps as he had, would fall into fewer mistakes, or be guilty of fewer omissions. However this may be, the work of Merrett was so completely superseded by the labours of the immortal Ray, that we need in no instance recur to it as authority. The *Synopsis* of Ray, traced through its various editions, having been written from real observation, and from absolute original scrutiny of almost every British plant, is the foundation of our present knowledge of the subject. He examined every plant recorded in his work, and even gathered most of them himself. He investigated their synonyms with consummate accuracy; and if the clearness and precision of other authors had equalled his, he would scarcely have committed an error. It is difficult to find him in a mistake or misconception respecting Nature herself, though he sometimes misapprehends the bad figures or lame descriptions he was obliged to consult.

In tracing the botanical history of British plants, I therefore consider Ray as the fountain-head of authority, but it is only Ray himself. Dillenius, the highly respectable editor of the last edition of the *Synopsis*, has, with commendable modesty and diffidence, distinguished from the original work all his own additions, being well aware of the danger of mistakes. If he had not done so, the preceding edition of the work in question, published in 1696, would have been our only resource; for it cannot be concealed that Dillenius

has added several plants upon insufficient grounds, either as species or natives, and has inserted others, supposed to be new, that exist under other denominations in the original work. Indeed the changes he has made among the synonyms, not being always marked, and proving often erroneous, oblige us on that head still to consult the edition of 1696.

The *Synopsis* of Ray, as published by Dillenius in 1724, was the standard book of English Botanists, till the works of Linnæus, more simple, compendious and perspicuous, if not more free from error, than any that had before appeared, came into general use throughout Europe. England, long accustomed to take the lead in science, would have seemed so far in a state of barbarism, if her vegetable productions had remained unarranged according to the new system; and she would have been of as little importance in Natural Science as France, partly from the same cause, and partly from her dancing after the bubbles of glittering theory, has till lately been.

Dr. Hill, a ready and experienced writer, and Mr. Hudson, a more accurate and practical observer, each undertook, about the same time, to make the pupils of Ray, already become veterans in his service, submit to Linnæan discipline. Many of them found the advantage of it; some proved refractory, and are forgotten; while a multitude of new disciples, allured by the attractiveness of the new system, and the doctrines by which it was supported, have been daily advancing its utility and celebrity. The *Flora Anglica* of Hudson has, almost from its first publication, to this hour, been the classical book of English Botanists. It has been the guide and ground-work of local Floras, as the *Flora Cantabrigiensis* of Mr. Relhan, *Flora Oxoniensis* of Dr. Sibthorp, and even the *Flora Scotica* of Mr. Lightfoot; for I by no means intend to detract from the practical merit of the authors of any of those works, when I assert, that

that they have in general adopted the synonyms of Linnæus and of Ray from the *Flora Anglica*. The work of Mr. Hudson has also been the basis of all publications besides Mr. Lightfoot's, intended to make the Botany of Great Britain accessible to those who could not read the Latin tongue, as Dr. Withering's *Botannical Arrangement*, and the vegetable part of Dr. Berkenhout's *Outlines*.

The authors just enumerated have followed the plan of Mr. Hudson himself, in applying the names, and even descriptions, in foreign authors, to the plants of Ray; an unexceptionable method if those authors were always correct, if we were certain they all spoke of the same plants under the same names, or quoted other writers without any misapprehension. This however being by no means the case, a great mass of error has been from time to time accumulating, which it requires more care and patience to remove than would be necessary to work out the whole subject afresh. Mr. Hudson commonly applies a Linnæan name to a plant, because Linnæus has quoted Ray for it, or because Haller, or Scopoli perhaps, has referred to Ray and Linnæus, while all three may chance to have intended a different species. He even copies synonyms of other authors from any of the above-mentioned, without looking at the books quoted; as may in many instances be proved by the errors of the press, and awkwardnesses of citation, which he has retained. He is however entitled to great praise for new-modelling the specific characters, when he found such as Linnæus had given did not well suit our plants, and on this ground he may rank as an original author. His descriptions also, which are original, are characteristic and valuable. Dr. Withering and Mr. Relhan, in copying descriptions from other writers, have always faithfully cited the source from which every article was derived; so that when those descriptions do not well accord, even with each

other, as it often happens, a Student may choose between them; preferring a description of Curtis, Lyons, or Hudson, to one of Haller or Scopoli, because of the probability of the species these last writers described not agreeing with our British ones, or with those of Linnæus. Haller indeed is far from correct in his Linnæan synonyms, so that I find it dangerous to quote him without very particular reasons. But if there be so much uncertainty in compiled synonyms and descriptions, even when we are informed from whence they are derived, what shall we say to Mr. Lightfoot's plan of copying from all quarters without any acknowledgment at all? His book is made up of passages from Linnæus, Haller, Scopoli, Dillenius and Gmelin; and he is not by any means attentive to the agreement of those passages with the native plants to which he applies them. If the writer of every *Flora* would give original descriptions or characters, from real wild specimens, his work must be valuable; and on this account Dr. Withering's third edition becomes a book of first-rate authority, no descriptions being more just than his, as far as they go. For the same reason Mr. Curtis's *Flora Londinensis*, though incomplete, ought to be ranked, independent of its excellent figures, next to Ray's *Synopsis* in original merit and authority upon English plants.

With these examples before me, to shun or to imitate, I have long laboured at the *Flora Britannica*; and it is evident that, on such a plan as I have proposed to myself, it cannot very speedily be completed. By studying original specimens in the great collections at the British Museum and at Oxford, I hope to bring the synonyms nearer to perfection than they are at present, and have already cleared up many difficulties. Many of my discoveries are daily given to the world in the *English Botany*; and I appeal to their number, not from ostentation, but as an apology for not having
more

more speedily completed my whole task, in which so many points more remain to be investigated.

By the above remarks, protracted perhaps to too great a length, I wish to introduce a botanical history of the British species of *Bromus*, a tribe of grasses which, when examined, fully justifies all I have said, and which could scarcely have been understood without a careful investigation of the old herbariums, the errors in authors being so great and unaccountable as could not be believed without such an investigation.

GENERIC CHARACTER.

BROMUS. Linn. Gen. Pl. 36. Juss. Gen. 32.

Calyx bivalvis. *Spicula* oblonga, disticha: *arista* infra apicem: *gluma* interior pectinato-ciliata.

All authors have found a difficulty in distinguishing this genus from *Festuca*, and some have united them. The *arista* being terminal in *Festuca*, and not so in *Bromus*, proves in most instances a sufficient character, to which I beg leave to add, that the inner glume of the corolla in *Bromus* is fringed with strong distant bristly hairs, whereas that part in *Festuca* is either smooth or finely downy. There are nevertheless difficulties attending these marks, which I shall point out hereafter.

I. BROMUS *secalinus*.

Smooth Rye Brome-grass.

B. paniculâ patente; pedunculis subsimplicibus, spiculis ovatis compressis decemfloris, flosculis distinctis teretiusculis.

Bromus fecalinus. Linn. Sp. Pl. 112.

B. polymorphus γ. Hudf. 49. var. 2. With. 159.

B. vitiosus. Weigel Obs. 4. t. 1. f. 2.

Festuca avenacea, spicis habitioribus, glumis glabris. Raii Syn. ed. 2. 261. ed. 3. 414.

F. graminea, glumis glabris. Scheuchz. Agrost. 251. t. 5. f. 10.

Gramen avenaceum segetale majus, glumâ turgidiore. Moris. Sect. 8. t. 7. f. 16.

In arvis minùs frequentër. Fl. Julio.

^ Near Edwinsford, Caermarthenshire, among the winter corn. Sir J. Banks, Bart. Fields in Suffex. Sir. T. Frankland, Bart.

Radix fibrosa, annua. *Culmus* tripedalis, foliosus, erectus, simplex, teres, glaber. *Folia* linearia; supra, margineque præcipuè, pilosa; subtus scabra. *Vagina* læviuscula. *Stipula* brevis, erosa, pilosa. *Panicula* vix semipedalis, patens; ramis semi-verticillatis, rectiusculis, angulatis, scabris, longitudine inæqualibus, plerumque simplicibus unifloris. *Spiculæ* ovatæ, ferè ellipticæ, compresso-planæ, flosculis 9 ad 12, basi remotis, unde rachis flexuosa, glabra, tota in conspectum venit. *Calyx* inæqualis, muticus, glumis ellipticis, glabris, trinerviis, margine membranaceis. *Flosculi* teretiusculi, glabri (rariùs pubescentes), albidovirescentes, nitidi; *gluma exterior* elliptica, turgida, nec depressa, obsoletè septemnervia, margine apicem versùs parùm membranacea, sub apice aristata; *arista* rectiuscula, scabra, glumâ brevior: *gluma interior* longe angustior et tenuior, concava, mutica, margine pectinato-ciliata. *Semen* cylindricum, supra fulco exaratum.

This

This species is not very common. It may easily be known by its broad oval compressed spikes, each consisting of not more than 10 or 12 cylindrical rather remote florets, almost always smooth, and drooping as they ripen from the length of their foot-stalks, which are for the most part quite simple.

2. BROMUS multiflorus.

Downy Rye Brome-grass.

B. paniculâ patente; pedunculis subsimplicibus, spiculis ovato-lanceolatis compressis quindecimfloris, flosculis subimbricatis teretiusculis.

Bromus multiflorus. *Weigel Obs.* 2. t. 1. f. 1. *Gmel. Syst. Nat. Linn.* 188.

B. fecalinus. *Leers* 36. t. 11. f. 2. *Lightf.* 1086. *Linn. Fl. Suec. ed.* 2. 96. var. 2.

Festuca graminea, glumis hirsutis. *Baub. Theatr.* 143. *Scheuchz. Agr.* 250. t. 5. f. 9.

In arvis rariùs. *Dill. in R. Syn.* 414. Fl. Julio.

Near Norwich. *Miss Hancock.* Between Edinburgh and New-haven.

Habitus præcedentis. Culmus glaber. *Folia* inferiora subtus nuda, supra ad margines subpilosa; superiora subtus brevi lanugine pubescentia, supra pilosa; omnia margine scabra. *Vagina* glabra. *Stipula* brevissima, lacera, vix pilosa. *Panicula* ut in priore. *Spiculæ* unciales, ovato-lanceolatae, compresso-planæ, flosculis 12 ad 16, imbricatis, demùm subremotis. *Glumæ* omnes plerumque mollissimè pubescentes, rariùs glabræ.

There is certainly great affinity between this species and the preceding, and they have been accordingly confounded, not only by Scopoli and Hudson, who have united several more distinct species into one, under the name of *polymorphus*, but also by most other authors. Scheuchzer and the accurate Weigel have however distinguished them, and the characters above given seem sufficient. The *B. multiflorus* has more numerous florets, more closely set, and more frequently downy, though not invariably so. Both kinds, with smooth glumes, are confounded in the collections of Buddle and Sherard, under the synonym of Ray which belongs to the former; as they are in the herbarium of Bobart under *Morif. Sect. 8. t. 7. f. 16*; but in the last-mentioned the glumes of *B. multiflorus*, though not downy all over, are rough on the keel.

3. BROMUS *mollis*.*Soft Brome-grass.*

B. paniculâ erectâ coarctatâ; pedunculis ramosis, spiculis ovatis, flosculis imbricatis depressis nervosis pubescentibus.

Bromus mollis. Linn. Sp. Pl. 112. Curt. Lond. fasc. 1. t. 8. Mart. Fl. Rust. t. 99. Relb. 44. Sibth. 47. Leers 37, t. 11. f. 1. Weigel Obs. 7. t. 1. f. 4. Schreb. Gram. 60. t. 6. f. 1, 2.

B. Linn. Hort. Cliff. 25, ex Herb. Cliff.

B. polymorphus α. Hudf. 48. var. 1. With. 159.

B. hordeaceus. Linn. Sp. Pl. ed. 1. 77.

B. n. 1504. Hall. Hist. V. 2. 236.

Festuca avenacea hirsuta, paniculis minùs sparsis. Raii Syn. 413.

Gramen avenaceum pratense, glumâ breviorè squamosâ et villosâ. Morif. Sect. 8. t. 7. f. 18.

β. Bromus.

β. *Bromus nanus*. Weigel Obs. 8. t. 1. f. 9. Herb. Linn.

In muris, aggeribus et pascuis vulgaris. Fl. Junio.

Radix fibrosa, parùm ramosa, albida, biennis. *Culmus* erectus, bipedalis, simplex, teres, striatus, sæpiùs glaber, subindè pubescens, geniculis tumidis, quandoque hirsutis. *Folia* (ut et vaginæ) striata, pilis mollibus canescentibus villosa, margine vix scabra. *Stipula* acutiuscula, lacera. *Panicula* bi-vel tri-uncialis, erecta, coarctata, demùm patentiuscula, decomposita; ramis semiverticillatis, simplicibus racemosisque, longitudine variis, angulatis, pubescentibus. *Spiculæ* erectiusculæ, ovatæ, acutæ, parùm compressæ, flosculis 5 ad 10, arctè imbricatis. *Calyx* e glumis duabus, inæqualibus, ellipticis, mucronatis, margine scariosis, carinatis, villosis, 7-9 nerviis, nervis viridibus, validis, extantibus. *Flosculi* calyci conformes, depresso-concavi, aristis scabris longitudine valvularum; *glumæ interiores* tenuissimæ, longèque angustiores, enerviæ, margine incrassato, viridi, ciliato. *Semen* ellipticum, depresso-planum.

Nothing can be more distinct than this common *Bromus* from the two already mentioned. Its compound dense panicle, and its strongly-ribbed, depressed, closely imbricated glumes, at once distinguish it. Few plants vary more as to luxuriance. The *B. nanus* of Weigel, sent by himself to Linnæus, is a starved dwarf variety, with few spikes in the panicle, as it often grows on walls. The same is in Buddle's herbarium.

We are certain from the Clifortian herbarium, now fortunately in Sir Joseph Banks's hands, that this is the only *Bromus* mentioned in the *Hortus Clifortianus*, though the synonyms there imply several

other species, and Linnæus afterwards quoted that work for *B. arvensis*. So necessary is the comparison of original specimens!

I think there can be no doubt of Scheuchzer's *Gr. avenaceum*, locustis villosis, angustis, candicantibus et aristatis, *Agr.* 254. t. 5. f. 12, being our *B. mollis*, though I have seen no specimen under his own hand, and therefore would not quote him.

4. *BROMUS racemosus*.

Smooth Brome-grass.

B. panicula erectiuscula diffusa; pedunculis simplicibus, spiculis ovatis sexfloris, flosculis imbricatis depressis nervosis glabris.

Bromus racemosus. Linn. Sp. Pl. 114.

B. polymorphus β et δ *Huds.* 49. var. 3 & 4. *With.* 160.

Festuca avenacea, spicis strigosioribus, è glumis glabris compactis.

Raii Syn. ed. 2. 261. *ed.* 3. 414.

Gramen avenaceum pratense, gluma tenuiore glabra. Dill. in Raii Syn. ed. 3. 414.

G. avenaceum pratense, gluma squamosa longiore glabra. Moris. Sect. 8. t. 7. f. 19. *Herb. Bobart.*

G. avenaceum hirsutum annuum, paniculâ ampliore magisque sparsâ locustis crassioribus glabris et aristatis. Till. Pis. 74. *Herb. Sherard.*

G. loliaceum alpinum, spicâ exili, rarioribus locustis. Ponted. Comp. 46. *Herb. Sherard.*

In pratis et pascuis. Fl. Junio.

At Holkham, Norfolk. Mr. Crowe. Northamptonshire. Mr. Dickson.

Præcedente

Præcedente toto habitu gracilior. *Radix* annua. *Culmus* ferè tripedalis, glabriusculus. *Folia* utrinque pilosa, margine parùm scabra. *Vaginæ* pilis plerumque deflexis hirsutæ. *Panicula* rara, diffusa (nec coarctata), simplex, pedunculis semiverticillatis, scabris, elongatis, indivisis, vix unquam bifloris. *Spiculæ* præcedentis, at glaberrimæ, vix septemfloræ, nitidæ, viridi alboque vittatæ, nervis minùs prominentibus, aristis scabris longitudine valvularum.

Linnæus described this species from an English specimen, less luxuriant than usual, and therefore more strictly racemose. The name however may be retained in allusion to the simple structure of the panicle. Even in the very luxuriant specimen, sent by Tilli to Sherard, the foot-stalks are mostly simple and single-flowered, by which, and the constant smoothness of its glumes, it may certainly be distinguished from *B. mollis*.

We have under this grass an instance of Dillenius's having inserted, as a new species, into his edition of the *Synopsis*, what existed there well defined already, for his is not even a variety of Ray's plant.

Dr. Withering, by an error totally unaccountable to me, quotes Mr. Afzelius as saying that "the *B. secalinus*, *hordeaceus* and *racemosus* are the same plant in the Linnæan herbarium, and that they are all varieties of *B. mollis*." This excellent Botanist must have spoken from recollection, and his memory deceived him, as any one may easily be convinced by looking at the specimens. Nor is this the only error of the same kind, which, without my participation or knowledge, has glided into the work of my intelligent and liberal friend, to whom I should have been happy at all times to have directly communicated all the information that might be consistent with my own undertakings, which I know to be all he would ever desire.

5. *BROMUS squarrosus*.

Corn Brome-grass.

B. paniculâ nutante; pedunculis simplicibus, spiculis ovatis duodecim floris, flosculis imbricatis depressis, aristis divaricatis.

Bromus squarrosus. Linn. Sp. Pl. 112. Hudf. 49. With. 160. Villars Dauph. V. 2. 115.

Festuca graminea, glumis vacuis. Scheuchz. Agr. 251. t. 5. f. 11.

Gramen phalaroides majus acerosum, nutante spicâ. Barrel. Ic. t. 24. f. 1.

In arvis Angliæ australiores. *Hudf. Fl. Julio.*

Radix fibrosa, parva, annua. Culmus pedalis, simplex, glaber, striatus, foliosus. Folia et vaginæ pubescunt, villis brevissimis deflexis. Panicula pauciflora, pedunculis secundis, simplicibus, compressis, apice incrassatis. Spiculæ omnium maximæ, ovatæ, tumidæ, nitidæ, flosculis 12 ad 16, arcuè imbricatis, depresso-concavis, glabris, subinde scabriusculis. Calyx inæqualis, nervosus, muticus. Glumæ corollinæ exteriores calyce parùm majores, multinerviæ, apice bipartitæ, aristis subulatis, scabris, recurvato-divaricatis, longitudine glumarum; valvulæ interiores longè minores, ciliis raris pectinatae. Semen ellipticum, depresso-concavum, corollæ adnatum, apice villosum.

This description is taken from several very excellent specimens in the Linnæan collection, for I have never seen any of British growth. It owes its place, therefore, in the list of English plants, entirely to Mr. Hudson, as Dr. Withering also remarks, and I am not without a suspicion of his having mistaken the true *B. secalinus* for this species.

6. *BROMUS*

6. BROMUS *arvensis*.

Field Brome-grass.

B. paniculâ patente; pedunculis ramosis, spiculis lanceolatis octo-
floris, flosculis ellipticis imbricatis depressis glabriusculis.

Bromus arvensis. *Linn. Sp. Pl.* 113. *Fl. Suec. n.* 97. *With.* 162.

Leers 38. t. 11. f. 3. *Villars Dauph. V.* 2. 116.

B. erectus β *Huds.* 50?

Festuca elatior, paniculis minùs sparsis, locustis oblongis strigosis
aristatis purpureis splendentibus. *Raii Syn. ed.* 2. 261. *ed.* 3.
414. *Herb. Sherard.*

F. graminea, effusâ jubâ. *Scheuchz. Agr.* 262. t. 5. f. 15.

F. avenacea sterilis elatior. *Rel. Rudb.* 15. f. 2.

Aegilops major, caule et foliis arundinaceis, locustis glabrioribus et
angustioribus e fusco xerampelinis. *Dill. Giff.* 130. *App.* 60.
Herb. Sherard.

Gramen bromoides ferotinum annuum, paniculâ rariore magisque
sparsâ, locustis angustioribus, purpurascens, glabris et
aristatis. *Till. Pis.* 76. *Herb. Sherard.*

Inter segetes rariùs. Fl. Julio.

Near Southampton. *Sherard.* At Earsham, Norfolk. *Mr.*
Woodward.

Radix fibrosa, parva, annua. Culmus tripedalis, erectus, simplex
(basi quandoque ramoso-luxurians), teres, striatus, glaber, foliosus,
geniculis quatuor vel quinque. Folia patentia, acuta, striata,
utrinque pubescentia, margine parùm scabra, longiùs vaginata.
Vaginæ cylindricæ, nervosæ, molissimè pubescentes, pilis deflexis.
Stipula brevissima, lacera. Panicula erectiuscula, multiflora, ramis

patentibus, numerosis, simplicibus et ramosis, scabris. *Spiculæ* ovato-lanceolatæ, erectiusculæ, demùm nutantes, nitidæ, purpureo variæ, plerumque glabræ, subinde oculo armato pubescentes. *Glumæ calycinæ* valdè inæquales, lanceolatæ, acutæ, carinatæ, nervosæ, margine membranaceæ. *Flosculi* 7 ad 10, arctè imbricati, elliptici, depresso-concavi, carinâ scabri, margine membranacei, nervis duobus approximatis longitudinalibus lateralibus; aristis glumâ plerumque longioribus, parùm infra apicem membranaceum e carinâ elongatâ exortis, rectis, subulatis, scabris: *glumæ interiores* minores, enerviæ, obtusæ, muticæ, margine pectinatæ. *Semen* apice villosum.

There is some doubt whether Mr. Hudson really knew this grass, or whether what he took for *B. arvensis* of Linnæus is merely a variety, as he made it, of his *B. erectus*; and this point can never be determined. The two species have less resemblance or affinity than most other *Bromi*, and could surely never be confounded.

7. *BROMUS erectus*.

Upright Perennial Brome-grass.

B. paniculâ erectâ; pedunculis subsimplicibus, flosculis lanceolatis teretiusculis, foliis radicalibus angustissimis ciliato-pilosis.

Bromus erectus. *Huds.* 49. *ed.* 1. 39. *With.* 160. *Sibth.* 47. *Relb. Suppl.* 2. 8. *Eng. Bot. t.* 471.

B. agrestis. *Allion. Ped. V.* 2. 249.

B. perennis. *Villars Dauph. V.* 2. 122.

B. n. 1507. *Hall. Hist. V.* 2. 237. *Davall.*

Festuca avenacea sterilis spicis erectis. *Raii Syn. ed.* 1. 237. *ed.* 2. 261. *ed.* 3. (exclusis synonymis) 413.

Gramen

Gramen bromoides pratense, foliis præter culmum angustissimis, rarâ lanugine villosus. *Scheuchz. Agr. 255. t. 5. f. 13.* From a specimen named by Scheuchzer himself in the Sherardian collection.

G. bromoides paniculatum, foliis et culmo villosis. *Scheuchz. Agr. 257.* according to the opinion of Sherard.

G. quod Festuca pratensis lanuginosa C. B. *Vaill. Paris. 93. t. 18. f. 2.* The synonyms very much confused.

G. avenaceum glabrum, paniculâ purpureo-argenteâ splendente. *Mor. V. 3. 213. n. 20. Herb. Bobart.*

G. loliaceum, locustis longis aristatis. *Mont. Prod. 35. f. 2. Herb. Sherard.* But the synonyms of Ray and Morison quoted by Monti are wrong.

G. sparteum, longâ et spicatâ paniculâ, Lolii utriculis, Festucæ potius, majus. *Barrel. Ic. t. 13. f. 1.*

In pascuis arenosis, cretâ substratis. Fl. Julio.

In the hedges beyond Botley near Oxford. *Bobart.* Ditchley Park. *Mr. Woodward.* Holkham, Norfolk. *Mr. Crowe.*

Radix perennis, fibrosa, cæspitosa, fibris villosis, fuscis. *Culmus* ferè tripedalis, erectus, strictus, simplex, teres, glaber (rariùs pubescens), ultra medium foliosus, geniculis circiter quatuor. *Folia* lineari-lanceolata, acutiuscula, striata, lætè viridia, scabra; radicalia angustissima, pilis longis albis sparsis adscendentibus ciliata, subinde involuta. *Vaginæ* striatæ, glabræ. *Stipula* brevissima, erosa. *Panicula* erecta, ramis erectis, scabris, numero et longitudine variis, simplicibus, rariùs bifloris. *Spiculæ* lineari-oblongæ, compressæ, erectæ, purpurascens, vel glabræ vel tomentosæ. *Glumæ calycinæ* lanceolatæ, acutæ, carinatæ; interiore majore, trinervi. *Flosculi* 5 ad 9, imbricati, lanceolati, compresso-teretiuf-

culi, subangulati, carinati, obsolete nervosi, carinâ scabri; aristis longitudine vix glumarum, parùm infra apicem membranaceum exortis, rectis, scabris. *Glumæ interiores* apicem versùs minutè pectinato-ciliatæ ciliis adscendentibus, minùs quam in maximâ parte Bromorum conspicuis. *Antheræ* crocæ. *Semen* lineari-oblongum, supra fulcatum, apice villosum.

The specimen of this *Bromus*, that ranks first in authority, exists in the Sherardian herbarium, and is thus inscribed in Sherard's hand:

"*Festuca avenacea sterilis, spicis erectis*, D. Bobart. *Synops. App.* This was first found by me, and given to Mr. Bobart. *Folia inferiora pilis longis obsita.*"

Under these very words it appears in the second edition of Ray's *Synopsis*; but, in the third, Dillenius has added synonyms of Plukenet and Morison, which belong to a widely different plant *B. muralis* of Hudson, *madritensis* of Linnæus, *diandrus* of Curtis, under which last name I shall presently describe it. Mr. Hudson however copies those synonyms under his *B. erectus*, adding, with a query indeed, *B. racemosus* of Linnæus; so that he includes under *erectus* three species, and, if his variety β be the real *arvensis*, even four. Other Botanists in the time of Dillenius seem to have confounded *B. erectus* and *diandrus*; and that circumstance perhaps led him into the same error. The latter species in Buddle's herbarium has the denomination *Festuca avenacea sterilis spicis erectis, D. Bobart*, which we have just proved to belong to the former, while there are three most distinct grasses, one of them *B. erectus* with downy glumes, in the same herbarium under the true synonym of *B. diandrus*, as will be shewn presently, not one of which is the real *diandrus*. Buddle has also the *erectus* in another place, with smooth glumes, with the synonym in Ray's *Synopsis*, which
belongs

belongs to *B. arvensis*, as above quoted. So in the Sherardian herbarium, along with authentic specimens from Scheuchzer and Monti of *B. erectus*, with their own names for it, are various others, some with downy glumes, others with smooth ones, to which Sherard has applied such a mass of confused synonyms from the Bauhins, Ray and Tournefort, that they only serve to shew he had really no clear ideas upon the subject, and that his authority, like that of too many other Botanists, is not to be implicitly relied on in matters of opinion or criticism, however valuable in the case of original specimens of plants found or described by himself.

With respect to Vaillant, his figure leaves no doubt of *B. erectus* being the plant he intended, though it may or may not be the *Festuca pratensis lanuginosa* of Bauhin; and his other citations are obscure, those of Ray certainly wrong.

Bromus erectus is easily known by its black perennial downy root, erect panicle and spikes, and especially by the radical leaves being much narrower than those on the stem, perfectly linear, and remarkably ciliated with distant long white hairs, pointing upwards. The accurate Mr. Swayne, as well as Mr. Woodward, has noticed its affinity to *Festuca*, to which genus I might have been tempted to remove it, on account of the perennial root, and the inner glume of the corolla being downy rather than pectinated. The *arista* however being, although a direct continuation of the *carina*, not strictly terminal, as the glume separates from it on each side, but more especially the great affinity between this grass and *Bromus asper*, an indubitable *Bromus*, make me retain it in that genus.

8. *BROMUS asper.*

Hairy Wood Brome-grass.

*B. paniculâ nutante ramosâ, flosculis lanceolatis teretiusculis sub-
enerviis, foliis uniformibus: inferioribus hirsutis.*

Bromus

Bromus asper. Linn. *Suppl.* 111. *With.* 161. *Mart. Fl. Rust.* t. 126.
Retz. *Prod. ed.* 2. 25.

B. ramofus. Linn. *Syst. Veg. ed.* 13. 102. (nec *Mant.* 34). *Huds.*
ed. 1. 40.

B. nemoralis. *Huds.* 51.

B. nemorosus. *Villars Dauph. V.* 2. 117.

B. hirsutus. *Curt. Lond. fasc.* 2. t. 8. *Relb.* 48. *Sibth.* 48.

B. montanus. *Pollich. V.* 1. 116. *Retz. Obs. fasc.* 2. 7.

Poa paniculâ nutante, laxâ, spicis oblongis, multifloris, sæpe aristatis.
Gmel. Sib. V. 1. 110. t. 21. *Herb. Linn.*

Gramen avenaceum dumetorum, paniculâ sparsâ. *Raii Syn.* 415.

G. avenaceum dumetorum, jubâ longiore, spicâ divisâ. *Morif.*
Seet. 8. t. 7. f. 27.

In nemorosis et sepibus, humidiusculis. Fl. Julio.

Radix annua vel biennis, fibrosa, fibris crassiusculis, horizontaliter patentibus, lævibus. *Culmus* 4- vel 5-pedalis, erectus, teres, striatus, foliosus, supernè glaber, sub trigenticulatus. *Folia* patentia, plana, acuta, nervosa, aspera atque pilosa, latitudine omnia ferè æqualia. *Vaginæ* teretes, vix carinatæ, nervosæ; inferiores pilis deflexis hirsutissimæ. *Stipula* brevis, lacera. *Panicula* pedalis, nutans, multiflora; ramis ramulisque plerumque binatis, elongatis, nutantibus, asperis. *Spiculæ* lineari-oblongæ, pendulæ, fusco-virides, subpubescentes. *Glumæ calycina* valdè inæquales, lanceolatæ, carinatæ, scabræ; majori trinerviâ. *Flosculi* circiter novem, imbricati, demùm laxè patentés, lanceolati, teretiusculi, carinati, obsoletè trinervii, carinâ præcipuè asperi, margine scariosi, sub apicem aristati, aristâ glumis breviorē; *glumæ interiores* crebrius ciliatæ, margine scarioso, inflexo. *Semen* sulco exaratum.

No difficulty attends this species, except what arises from the number of names that have been given it, owing to Linnæus having by accident called another *B. ramosus*; so that this requiring a new name, every person gave one according to his fancy. It is easily distinguished from the preceding, to which, though no one has yet compared them, it is most nearly a-kin; but its annual, or at most biennial, pale smooth root, broad uniform hairy leaves, and branched drooping panicle, characterize it sufficiently. Authors have laboured to distinguish it from *B. giganteus* of Linnæus, some having most carelessly considered them as the same species. In that however the root is perennial, the spikes small, florets fewer, nearly ovate, scarcely carinated, their inner valve though rough not ciliated, and their *arista*, as Villars well observes, terminal, for which two last reasons particularly I have ventured to remove it to the *Festuca*.

9. *BROMUS sterilis*.

Barren Brome-grass.

B. paniculâ nutante subsimplici, flosculis lanceolatis nervosis fulcatis, foliis pubescentibus.

Bromus sterilis. *Linn. Sp. Pl.* 113. *Huds.* 50. *With.* 162. *Relb.* 46. *Sibth.* 47. *Curt. Lond. fasc.* 1. t. 9. *Mart. Fl. Rust.* t. 125. *Leers* 37. t. 11. f. 4. *Ger. em.* 76.

Festuca avenacea sterilis elatior, seu Bromos Dioscoridis. *Raii Syn.* 412.

F. graminea annua sterilis, spicis dependentibus. *Morif. Sect.* 8. t. 7. f. 11.

In arvis, ruderatis et sepibus vulgaris. Fl. Junio, Julio.

Radix

Radix annua, fibrosa, parva, fibris capillaribus. *Culmus* sesquipedalis, erectus, gracilis, teres, striatus, ad apicem usque foliosus, geniculis 5 vel 6. *Folia* patentia, plana, subflaccida, angusta, acutiuscula, nervosa, utrinque mollissimè pubescentia, margine scabriuscula. *Vaginæ* cylindricæ, nervosæ, mollissimè villosæ, pilis parùm deflexis. *Stipula* oblonga, lacera. *Panicula* spithamæa, nutans; ramis sæpiùs ternis, elongatis, nutantibus, asperis, simplicibus, vix unquam bifloris. *Spiculæ* lanceolatæ, pendulæ, fusco-virentes, scabræ. *Glumæ calycinæ* maximè inæquales, lanceolatæ, scabræ; majori angulatâ, nervosâ. *Flosculi* 6 ad 8, imbricati, demùm patentiusculi, lanceolati, compressi, carinati, asperi, 7- vel 9-nervii, nervis duobus submarginalibus maximis, inter nervos fulcati atque subpubescentes, apice ipso ferè aristati, aristis glumâ longioribus, scabris; *glumæ interiores* fetis raris pectinatæ, margine scariofo inflexo. *Stamina* tria. *Semen* sulco exaratum.

This common *Bromus* is readily known by its drooping, almost simple, flower-stalks, and narrow downy leaves. The strong nerves of the glumes, a part hitherto generally much neglected in grasses, are remarkable in this and the next species.

10. BROMUS *diandrus*.

Upright Annual Brome-grass.

B. paniculâ erecto-patente subramosâ, flosculis lanceolatis nervosis fulcatis diandris.

Bromus diandrus. Curt. Lond. fasc. 6. t.

B. madritensis. Linn. Sp. Pl. 114. With. 161.

B. muralis. Hudf. 50. Sibth. 48.

B. ciliatus. Hudf. ed. 1. 40.

B. sterilis,

B. sterilis, erectâ paniculâ, major. *Barrel. Ic. t. 76. f. 1.*

Festuca avenacea sterilis, paniculis confertis erectioribus, aristis brevioribus. *Raii Syn. ed. 2. 261. Pluk. Phyt. t. 299. f. 2. Herb. Sherard.*

F. avenacea sterilis, pediculis brevioribus et spicis erectis. *Morif. V. 3. 212. n. 13.*—et *F. graminea annua*, spicis erectis. *EjUSD. Sect. 8. t. 7. f. 13. Herb. Bobart.*

Gramen bromoides pumilum, locustis erectis, majoribus aristatis. *Scheuchz. Agr. 260.* Sent by Scheuchzer himself to Sherard.

In arenosis et ad muros passim. Fl. Junio.

Common on the sandy grounds in Jersey. *Sherard.* At the foot of St. Vincent's rock, Bristol, on the farther part near the meadows. *Sir J. Banks, Bart. Near Battersea. Curtis.*

Radix annua, fibrosa, parva. *Culmi* pedales vel sesquipedales, erecti, stricti, graciles, teretes, striati, glabri, foliosi, geniculis plerumque tribus. *Folia* præcedentis, at minus pubescentia, sæpè omnino glabra. *Vaginæ* nervosæ, subcarinatae, sæpius glabræ, quandoque pilosæ, pilis deflexis. *Stipula* brevis, erosa. *Panicula* vix triuncialis, erecta, fastigiata; ramis ternis, quaternis, quinisve, scabriusculis, plerumque simplicibus, brevibus, unifloris, solo fertiliori tantum elongatis et ramosis, semper tamen erectis vel erectiusculis, nunquam pendulis. *Spiculæ* lineari-lanceolatae, erectæ, sæpius fuscescentes, scabræ. *Flosculi* præcedentis, sed diandri, minusque argutè nervosi, nervis duobus lateralibus approximatis præcipuè conspicuis.

The essential character of this species consists in its flower-stalks being short and erect, leaves almost smooth, glumes much less

strongly nerved than in the last, and especially in its florets having but two stamina, which has been observed by Mr. Curtis, as well as by Dr. Withering who found the same grass in Portugal. I have by comparison proved it the *B. madritensis* of Linnæus; but it being far from peculiar to Madrid, I make no scruple to prefer the expressive name *diandrus*. It is very distinct from the *B. rubens*. Like most plants that live in a sandy soil, it varies greatly as to size.

Great obscurity involves the early synonyms of this grass, inasmuch that nothing but the investigation of original specimens could clear it up. The most important of these is one in the Sherardian herbarium, with a ticket inscribed by Sherard, thus: "This I found common on the sandy grounds in Jersey. 'Tis shorter awned than the *Bromus sterilis*, lower and more upright." Hence we learn with certainty that the plant intended by Ray, in the second edition of his *Synopsis*, p. 261. n. 4. is our *B. diandrus*. We learn with equal certainty from the collection of grasses made by Bobart, and referring all through to that part of Morison's *Historia*, of which he was the editor, that he knew it to be the plant of Ray, and that he intended it himself under the name and figure in Morison, to which I have referred above. Dillenius however, strange to tell, in his edition of the *Synopsis*, applies these synonyms to the *B. erectus*; and under the definition which belongs to the *diandrus*, he quotes a passage in Petiver's *Concordia Graminum*, and gives a figure and description of his own, all which apply to *Festuca uniglumis* of Solander, *Lolium bromoides* of Hudson, which is the plant Dillenius found on the coast of Sussex, and, as it appears from Buddle's herbarium, what Mr. Dale gathered in Mersey Island. This error of Dillenius is noticed on a ticket, which accompanies the genuine specimen of *B. diandrus* in the Sherardian collection, on which is written, in a scrawling hand unknown to me,

me, but certainly neither Dillenius's, Sherard's, nor Buddle's, the proper reference to Ray's second edition, and Plukenet, t. 299. f. 2. with a remark in Latin, that "another grass is exhibited for this in the *Synopsis*," that is in the third edition. Yet with this are two poor specimens of the same grass, marked with the original definition of Bobart, and the reference to the Appendix to Ray's first edition, p. 237, which belongs to *B. erectus*, as I have already mentioned. This is written in a handsome hand, to which I am likewise a stranger. A more complicated blunder exists in Buddle's herbarium. Under the inscription "*Festuca avenacea sterilis, paniculis confertis erectioribus, aristis brevioribus*, D. Sherard, *Raii Syn.* 261," are three most distinct and dissimilar plants. In the first place *Bromus scoparius* of Linnæus, next *B. erectus* with downy glumes, and lastly *Festuca uniglumis*, under which last is written (by Buddle as well as the rest) "collectum in ins. Mersea propè Colcestr. a D. Dale, R. H. 1287." So that there is only wanting the real grass to which the said inscription properly belongs. I was once inclined, on this authority, to add *B. scoparius* to the British Flora; but as there is no proof in Sherard's own collection of his having found it in Jersey, we must suppose Buddle had it from some other quarter, and, merely from his own judgment, referred it to the plant of Sherard and Ray.

From the above tedious but necessary detail, I trust the confusion of synonyms between *B. erectus* and *B. diandrus*, which exists in Hudson and all other writers who have touched upon them, will be accounted for, and in some measure excused, though it must be confessed the author of the *Flora Anglica* had the means in his power of clearing it up, had he been sufficiently attentive. It will also appear from the history of such mistakes, which are abundant throughout every British *Flora* we have yet seen, that the comple-

tion of a more perfect one is not the work of a day. Indeed the contemplation of them, and the certainty that in so intricate an undertaking similar errors are scarcely to be wholly avoided, are sometimes sufficient to daunt the most ardent investigator, and make him sensible how much he himself may need the correction and indulgence of future critics.

II. BROMUS *sylvaticus*.

Slender Wood Brome-grass.

B. spicâ simplici nutante secunda, spiculis sessilibus teretiusculis, aristis glumâ longioribus, foliis pilosis.

Bromus sylvaticus. *Pollich. V. 1. 118. Pourret Act. Tolos. V. 3. 308.*

B. pinnatus. *Fl. Dan. t. 164.*

B. gracilis. *Weigel Obs. 15. t. 1. f. 11.*

Festuca sylvatica. *Huds. ed. 1. 38. With. 158. Relb. 44. Sibth. 46. Lightf. 103. Mart. Fl. Rust. t. 114. Dickf. H. Sicc. fasc. 13. 9.*

F. pinnata β . *Huds. 48.*

Triticum n. 1432. *Hall. Hist. V. 2. 213.*

Gramen avenaceum dumetorum spicatum. *Raii Syn. 394.*

In dumetis, nemorosis, et sepibus frequens. Fl. Julio.

Radix perennis, fibrosa, cæspitosa, fusca. *Culmi* bipedales, erecti, simplices, teretes, foliosi, glabri, apice attenuati et inclinati. *Folia* patentia, latiuscula, acuminata, rigidiuscula, lætè viridia, scabra, nervosa, subtùs præcipuè striata, magis vel minus pilosa. *Vaginæ* strictæ, striatæ, pilosæ. *Stipula* brevis, obtusa, lacera. *Spica* simplex, nutans, ferè triuncialis, rachi subflexuosâ, striatâ, scabrâ,

scabrâ, hinc canaliculato-compressâ. *Spiculæ* 6 vel 7, alternæ, sessiles, secundæ, non divaricatæ, lineari-lanceolatæ, luteo-virides plerumque pubescentes. *Glumæ calycinæ* inæquales, lanceolatæ, brevius aristatæ, nervosæ, apicem versùs hirtæ. *Flosculi* 6 ad 9, imbricati, demùm patentiusculi, subcylindrici, apicem versùs præcipuè nervosi atque hirti. *Arista* terminalis, glumis plerumque longior, subulata, scabrâ. *Gluma interior* linearis, retusa, fetis erectis rigidis ciliata.

The inner glume being strongly pectinated in this grass and the following one, seems to me a sure indication of their being *Bromi*, and that any thing to the contrary in the insertion of the *arista*, being in many species very difficult to determine, and in some variable, is of less real moment. In habit also these plants agree with other *Bromi* rather than with *Festucæ*, except indeed their perennial roots.

12. *BROMUS pinnatus*.

Spiked Heath Brome-grass.

B. spicâ simplici erectâ distichâ, spiculis sessilibus teretiusculis, aristis glumâ brevioribus, foliis nudiusculis.

Bromus pinnatus. *Linn. Sp. Pl.* 115. *Huds. ed.* 1. 41. *Pollich. V. I.* 117. *Weigel Obs.* 14. t. 1. f. 10.

Festuca pinnata. *Huds.* 48. *Relb.* 44. *Sibth.* 46. *Dicks. H. Sicc. fasc.* 13. 8.

Triticum n. 1431. *Hall. Hist. V.* 2. 212.

Avena læta. *Salisb. Prod.* 22.

Gramen spicâ Brizæ majus. *Raii Syn.* 392. *Rel. Rudb.* 11. f. 2.

G. sparteum, spicatâ Brizæ paniculâ et corniculatâ. *Barrel. Ic. t.* 25.

In campis et ericetis, solo calcareo. Fl. Julio.

Not uncommon in Yorkshire, Oxfordshire and Kent.

Radix

Radix perennis, fibrosa, subrepens. *Culmus* sesquipedalis vel bipedalis, erectus, simplex, teres, foliosus, glaberrimus, apice rectus et rigens, parùmque attenuatus. *Folia* erectiuscula, lanceolata, acuminata, rigidula, striata, nervosa, scabra, sæpiùs nuda, rariùs suprà pilosa. *Vaginæ* strictæ, striatæ, glaberrimæ. *Stipula* brevis, obtusa, ciliata. *Spica* simplex, erecta, longitudine varia, rachi subflexuosâ, striatâ, angulis scabrâ, hinc complanatâ. *Spiculæ* 6 ad 10, alternæ, sessiles, distichæ nec secundæ, erectæ, lineari-lanceolatæ, pubescentes. *Glumæ calycinæ* parùm inæquales, lanceolatæ vel subovatæ, subaristatæ, multinervosæ, margineque præcipuè hirtæ. *Flosculi* 6 ad 12, vel etiam plures, arctè imbricati, subcylindrici, apicem versùs præcipuè nervosi atque hirti. *Arista* terminalis, glumis plerùmque brevior, quandòque etiam brevissima, subulata, scabra. *Gluma interior* retusa, setis erectis ciliata ut in præcedente.

This has been united, by many Botanists, with the last, to which it is certainly nearly allied; but there are several points of difference which seem to keep them distinct. These are the erect distichous spike, the firmer habit, less hairy leaves, and short awns of *B. pinnatus*.

XXIV. *Some Corrections of the general Description of Polytrichum rubellum, p. 79, with an Account of another new Species of the same Genus. By Mr. Archibald Menzies, F.L.S.*

Read March 6, 1798.

IN the general description of *Polytrichum rubellum*, at page 79, line 8 from the bottom, for "an inch to two inches," read "half an inch to about an inch." At page 80, line 1, for "from an inch to an inch and half," read "about an inch;" and in line 6, for "long and subulate," read "flat, but in the centre slightly pointed."

These mistakes happened in consequence of my having considered the following from New Zealand, on a slight comparison, to be the same: but in examining more perfect specimens, since the paper on the genus *Polytrichum* went to the press, I have been induced to make it a distinct species, which ought to have come in between *P. rubellum* and *P. dentatum*; but which I now beg leave to add:

14—15. *POLYTRICHUM subulatum*, fol. lanceolatis carinatis cartilagineo-ferratis dorso denticulatis, capsulis cylindricis erectiusculis, operculo subulato. TAB. 6. FIG. 5.

Hab. in Nova Zeelandia. Nelson.

This

This species was found amongst the duplicates of Mr. Nelson's collection of plants from New Zealand, in Sir Joseph Banks's Herbarium; and as it agrees so nearly with *P. rubellum*, perhaps the best manner of describing it is to point out the difference.

The *stalk* of this is slightly branched, and in general taller than *P. rubellum*. The *leaves* are larger and more acutely lanceolate, with whitish edges finely ferrated, and middle nerves strongly dentated; their texture is more tender and fragile; their colour in the dried state is the same, but whether they are reddish, like the others, in their recent state, is uncertain; they are more crowded at the tops and about the divisions of the branches. The *peduncles* in general are at least half an inch longer, and terminate both the upper and lower branches; but the most remarkable difference is in the *operculum* being long and subulate, whilst in the other it is flat, with a small point issuing from its centre. The *capsule*, in this, is longer and more slender, and the exterior *calyptra* is of a subulate shape, whilst in the other it is of a conical figure.



END OF THE FOURTH VOLUME.

DIRECTIONS

FOR PLACING THE PLATES OF THE FOURTH VOLUME.

TAB.	1.	Tringa maritima,	—	—	to face page	22
	2.	Tringa nigricans, &c.	—	—	—	40
	3.	Anomia cuspidata,	—	—	—	46
	4.	Anomiæ,	—	—	—	47
	5.	Locusta falvifolia,	—	—	—	58
	6.	Several Species of Polytrichum,	—	—	—	76
	7.	Ditto,	—	—	—	84
	8.	Spinning Limax, and Dipus canadensis	—	—	—	85
	9.	Tracheæ of various Kinds of Birds,	—	—		128
	10.					
	11.					
	12.					
	13.					
	14.					
	15.					
	16.					
	17.	Orobanche minor & elatior	—	—	—	187
	18.	Ichneumon punctum and Phasma dilatatum	—	—	—	192
	19.	Rostra and Maxillæ of Ammophila, &c.	—	—	—	212
	20.	Lambertia formosa	—	—	—	223
	21.	Muscicapa malachura,	—	—	—	242
	22.	Pausus microcephalus & sphærocerus,	—	—	—	274

